IMPROVING THE PERCEPTION OF FOREIGN-ACCENTED SPEECH THROUGH TRAINING: A COMPARISON OF WORD AND SENTENCE MATERIALS

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ABSTRACT

This study was conducted to test whether three days of high variability training consisting of either word-only or sentence-only materials would most effectively improve native listener accuracy for non-native speakers. Listeners were separated into a word training (N=14), sentence training (N=13) or control group (N=14). The training groups received an equal amount of exposure to identical target words spoken by the same five Spanish-accented speakers. Depending on the training, targets were presented either as single word tokens or were combined to form semantically anomalous sentences. The phonetic makeup of each list and the order of speakers were held constant throughout both the training and testing portions. At testing, all listeners were evaluated for accuracy of transcription on word and sentence tokens with a speaker used in training and with a novel speaker.

Results showed that listeners who heard sentence-only information were best able to utilize their training. The group trained only with sentences significantly outperformed the control group in all sentence testing. This included both the familiar and the novel speaker with sentences that had been used in training and those that were unique to the post-test. The sentence-only group also outperformed the controls and matched the performance of the word training group in testing with single words. The employment of several strategies including the utilization of prosodic elements available in the spoken sentences and an exposure to a wider range of phonetic environments likely led to the improvement. The results suggest that for native listeners and non-native speakers, a high variability paradigm can be employed successfully when paired with sentence level information as all benefits found with word-only training were met or exceeded by sentence-only training.

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I. INTRODUCTION

Speech in every language is filled with diversity. A wide array of factors, including the length and shape of the oral and nasal tracts as well as the positioning of articulators, cause people to produce sound differently. Speaker tempo, regional dialect and speaking environment add to this dissimilarity. Even individual speakers show variation when producing the same speech sound at different moments. In spite of this, speakers of the same language are readily able to understand one another in countless situations.

One possible explanation for such success is that listeners "normalize" the speech that they hear (Pisoni 1997). By removing variables that are unimportant to the immediate signal, listeners are essentially able to map onto existing sound categories in their inventory. Continued exposure to a speaker, then, may allow listeners to include the new signal in their exemplar category. Consequently, listeners will be able to process a particular speaker with even less effort. Previous studies, in fact, have shown that perception accuracy (Verbrugge, Strange, Shankweiler and Edman 1976) and perceptual processing time (Allard and Henderson 1976) were negatively affected by speaker variability.

Mullennix, Pisoni and Martin (1989) investigated how perception was affected by talker variability using English speakers and listeners. The researchers compared listeners' abilities to discriminate words from a single speaker versus the same words provided by a group of fifteen speakers. The stimuli from both groups were presented in high signal-to-noise ratios as well as low signal-to-noise ratios.

The researchers also included variations in lexical density and word frequency as mitigating factors.

Across tasks and stimuli, Mullennix et al. (1989) found that perceptual accuracy was increased and response time was decreased in trials when only a single speaker was used. The results were found despite the fact that no training had been employed. The researchers posited that "the processes involved in speech perception apparently include some mechanism or set of mechanisms that adjust for differences in a talker's voice, and these mechanisms have a processing 'cost' associated with them" (Mullennix et al. 1989, 375).

Mullennix et al. (1989) showed that among native speakers and listeners an advantage existed with a single speaker but a noteworthy question concerning the "normalization" hypothesis remained. Namely, will the benefits found with limited variability within one's native language, then, also occur when a native speaker listens to speech produced by a foreign-accented speaker? Important differences between the speech of native and non-native speakers may lead to an expectation of dissimilar results. For example, in the early stages of L2 acquisition the variation within an individual speaker's utterances is enhanced since "the learner may produce a sound found in L2 words that does not have an exact phonetic equivalent in the L1 by substituting the nearest L1 sound" (Flege, Frieda, Walley, and Randazza 1998 , 156). Even after the initial stages of learning have passed, accented speakers will likely continue to produce sounds that are not exact equivalents of native productions.

Clarke (2002) directly addressed the issue and found that very little exposure was necessary to improve listeners' perceptual ability with a single speaker even when the speaker had a foreign accent. While not directly comparing multiple speakers to a single speaker, the evidence did show that in the span of only four sentences, listeners were able to decrease reaction times and lower error rates on tests with the same accented speaker.

Clarke and Garrett (2004) also utilized a foreign-accented speaker to show that adaptation to a single speaker could occur in a very short amount of time. In experiment 1 of their study, Clarke and Garrett separated listeners into three groups that each heard a total of sixteen sentences in which the final word of the sentence could not be predicted by the context of the sentence. The *accent* group listened to sixteen sentences produced by a single Spanish-accented speaker. The *control* group heard twelve sentences spoken by a native English speaker and then four spoken by the Spanish-accented speaker while the *no accent* group heard sixteen sentences spoken by a native English speaker. Following each sentence, listeners were shown a target word on a computer screen and asked to decide whether or not the visually presented word was the final word of the spoken sentence. Reaction time measurements were collected for each response.

The results of Clarke and Garrett (2004) revealed that by the end of the sixteen sentences, the mean reaction time of the *accent* group with foreign-accented speech was nearly the same as the *no accent* group responding to native speech. The results support Mullennix et al. (1989) and Clarke (2002) in showing that listeners are

able to improve significantly to stimuli presented by a single speaker even when no training was implemented. The shortcoming of these studies, however, is that they fail to demonstrate that the positive effects shown with a single speaker can generalize to the wide assortment of input that people encounter everyday.

While the former studies looked at overall perceptual improvements, several studies have utilized second language learners in an attempt to target specific perception difficulties. Strange and Dittman (1984), for example, tested the hypothesis that Japanese listeners could learn to differentiate the /r/ and /l/ contrast in English. Strange and Dittman employed a low variability training paradigm whereby only a single speaker is used in the presentation of the speech samples. By presenting the contrast only in initial singleton position and training with only a single synthetic speaker, the researchers assumed that the learners would be able to form a concrete prototype of each sound. This prototype would presumably be applied to the same sound in other environments.

Researchers initially presented listeners with a pretest that highlighted the contrast in both “rock-lock” and “rake-lake” in a synthetic series and a minimal pair contrast using a native English speaker. Next, four of the eight learners completed between 14 and 18 sessions of training with the other 4 serving as controls. During these training sessions the trainees were repeatedly exposed to the synthetic “rock-lock” stimuli. At the end of training, learners were retested on the three contrasts presented in the pretest.

The results were mixed. For the synthetic “rock-lock” contrast, all eight learners showed improvement in their performance, showing that training for this aspect was beneficial. The ‘rake-lake” contrast revealed varying levels of progress. Half of the participants failed to show any improvement and only one member increased to the highest level. Performance on the real-speaker minimal pair contrast was disappointing as only two subjects showed improvement. In fact, one of these subjects, although showing improvement from pre to post-test, was the poorest overall performer. The researchers reported that “they cannot conclude that this training experience generalized to perception of the phoneme contrast in real speech by a native AE speaker” (Strange and Dittman 1984, 141).

Bradlow, Pisoni, Akahane-Yamada and Tohkura (1997) also used Japanese speakers to test the effects of training on /r/ and /l/ perception. While they approached the same language contrast, they did so using a different training paradigm. The researchers utilized high variability training which required participants to listen to numerous different speakers producing the same sound contrast. Listeners participated in 45 training sessions in which five native English speakers produced /r/ and /l/ in initial singleton, initial cluster, intervocalic, final singleton and final cluster position.

The result of the post-test showed that those listeners involved in training improved their perception accuracy from 65% in the pretest to 81% in the post-test. Additionally, the training group performed much better than the control group in both tests of generalization. Trainees not only performed better with the same speakers

using words that were used in training but were also able to extend their learning to novel words produced by a novel speaker. Both tasks showed the training group exhibiting an average score nearly 20% higher than the control group.

A direct, within-study, comparison between the low variability training used in Strange and Dittman (1984) and the high variability training administered in Bradlow et al. (1997) took place in Lively, Logan and Pisoni (1993). Like Strange and Dittman (1984) and Bradlow et al. (1997), the study utilized Japanese learners and their ability to perceive the /l/ and /r/ distinction in English. While previous studies have conflated the effects of talker and stimulus variability, Lively et al. (1993) were able to effectively tease them apart.

In the first experiment, with high variability, the phonetic environments for /l/ and /r/ were limited during training. Instead, the researchers used only those positions previously found to be most difficult, namely initial singleton, initial clusters and intervocalic positions spoken by five different speakers. Participants were trained using a two-alternative forced choice procedure that required participants to indicate whether /l/ or /r/ was present in the previous word. The second experiment, with low variability, had a single talker but utilized all five phonetic positions. The same forced choice training paradigm used in experiment 1 was used in experiment 2. Participants in both experiments took a pre-test, underwent their respective training, and then took a post-test and additional generalization tests with new words and new speakers.

The results of the two experiments revealed that while both groups improved from pre to post-test, the high variability group performed much better with novel words and novel speakers. Lively et al. (1993) suggest that the learners in the low variability experiment were unable to match improvements in novel situations made by those in the high variability experiment because they had a narrow set of exemplars. The individuals in the first experiment, using high variability, established a wide range and therefore could better understand the wide array of talker variation (Lively et al. 1993). According to the researchers, "training with multiple talkers who produce only difficult contrasts appears to be a sufficient condition for generalization to new tokens produced by a familiar talker and to novel tokens produced by an unfamiliar talker" (Lively et al. 1993, 1252).

While the majority of previous research, including Strange and Dittman (1984), Lively et al. (1993) and Bradlow et al. (1997) aimed to train non-native listeners on native sounds, Weil (2001) attempted to train native listeners on foreign-accented speech. Weil (2001) used a wide battery of tests to measure native listeners' abilities to improve their perception of a completely unfamiliar foreign accent. Tests were run not only on the trainees' capacity to improve with the speaker used in training but also with a similarly accented new speaker and a speaker from an unrelated language family.

In the pretest, listeners were first measured on their ability to understand English produced by a speaker of Marathi, a member of the Indo-Aryan language family. The measurements involved a phonetically balanced list task in which

listeners were asked to transcribe single monosyllabic words, a Haskins sentence task where the listeners transcribed sentences that were syntactically correct but semantically meaningless, a prose passage task where listeners were asked to answer true/false questions based on passages read by the speaker, a Harvard sentence task in which the listeners transcribed sentences that were both syntactically and semantically correct and a modified rhyme task where the listeners chose the word they were presented orally from six possible alternatives. For each task, participants were asked to transcribe what they had heard and were credited with a correct response only when the transcribed word either perfectly matched the target or was a homophone of the target.

Following the pretest, the trainees underwent three days of low variability training involving only the speaker used in the original assessment. Training consisted of four of the five tasks involved in the pretest. The modified rhyme task was not included in training because of the limited number of usable possibilities for the task (Weil 2001). No feedback was given to participants at any point during training.

In the post-test phase, both the training and no-training groups completed the same five tasks that had been administered in the pretest. In addition to the original Marathi speaker, participants were also tested on a second Marathi speaker and a Russian speaker. The researcher proposed that there would be an additive benefit. More specifically, it was expected that gains made from the training would be evident at different levels depending on the speaker. It was predicted that simple training

effects would give the trainee group a 5% advantage with the Russian speaker, a combination of training and accent effects would lead to a 15% difference with the similarly accented second Marathi speaker and a 25% improvement would be realized on the Marathi speaker used in training due to training, accent and speaker effects.

Results of the post-test revealed that while the trainee group outperformed the no-training group on every measure, the level of benefit depended upon the task. On the single word tasks, specifically the phonetically balanced list and the modified rhyme task, listeners improved more than 10% from pretest to post-test but only a 5% training effect was found for both the similarly accented Marathi speaker and the Russian speaker. However, in the sentence level tasks, the Haskins and Harvard sentence tasks respectively, the 15% and 13% improvements made with the talker used in training were mirrored by equivalent improvements made with the similarly accented speaker. Results with the Russian speaker improved by a modest 5%. Weil (2001) suggests that the wide disparity of ability to generalize depending on the task may be due to sentence-level processing placing larger demands on memory than word-level processing does. However, the researcher notes, "if the underlying encoding is phonetic, the level should be immaterial" (Weil 2001, 36).

Weil (2001) showed that accuracy can be improved with foreign-accented speakers using low-variability training. The ability of the trainee group to extend accuracy improvements to novel speakers of the same language in a sentential context is promising. Unfortunately, because all subjects in the experiment were trained on both sentences and words it is impossible to determine whether any of the training

methods were more effective than the others. It is possible that the effects shown in testing could have resulted from any of the training methods individually without the need to include the others.

Most recently, Wade, Jongman and Sereno (2007) approached the notion of improving perception by training native English listeners with Spanish-accented speech. Experiment 1 in the study utilized trainees listening to Spanish-accented English in high variability training which had produced significant results in previous non-native training studies such as Bradlow et al. (1997) and Lively et al. (1993). It was expected that this type of training would increase the listener's ability to generalize to other Spanish-accented speakers.

Following a pretest in which participants heard a single speaker read one 50-word phonetically balanced list, listeners were randomly separated into a training and a control group. The training group was asked to transcribe, via computer, individual words they heard from the Spanish-accented speakers. Training took place over three consecutive days with listeners being presented one novel word list from each of the four training speakers daily. Accuracy feedback was given throughout the training. Next, both groups underwent a post-test in which the speaker used in the pretest and a novel speaker read one list each.

Although the trainees did demonstrate slight improvement in session-to-session perception with the individual speakers involved in the training, they failed to make a noticeable improvement with a novel speaker. Additionally, and surprisingly, controls fared better in the post-test than did the trainees. According to Wade et al.

(2007), “the three-day high variability training program had little effect on listeners’ ability to recognize isolated Spanish-accented monosyllabic words, either for a previously heard or a new speaker” (Wade et al. 2007, 126).

The rate of success in making significant changes in perception through training seems to depend on several factors. Both native and non-native speaker training have demonstrated that if the requirement is an improvement with a single speaker, then low variability training can accomplish this goal in a very short amount of time (Strange and Dittman 1984, Mullennix et al. 1989, Clarke 2002, Clarke and Garrett 2004). However, if the ability to apply this improvement to novel speakers is a requirement, high variability training seems to be a better option. Through this training, individuals have been shown to make marked improvement in generalizing their knowledge to new native speakers (Lively et al. 1993, Bradlow et al. 1997). The findings in studies using native listeners and non-native speakers, however, have thus far failed to make such a clear connection. Weil (2001) found positive effects with generalization in sentence level testing using low variability training but was unable to show improvement at the single word level. Similarly, Wade et al. (2007) failed to find improvements with single word tokens when implementing high variability training.

The exact reason for the disparity between the two undertakings is unclear. It is likely that at least part of the reason is the numerous differences that exist in non-native groups but not in native speakers. For example, native speakers almost without exception learn their L1 in early childhood, so much of their knowledge of

the language has become ingrained, allowing them to correctly produce the sounds and grammar of their language with little or no effort. Second language learners, on the other hand, must deliberately learn not only the rules that govern the syntax of a language but also the array of employed phonemes that vary between their native language and the new language. This may require learners to decipher phonemes that do not exist in their L1 and therefore have no referent.

Further complicating the process is evidence that age-of-acquisition of the L2 and length of residence in the L2 environment each contribute to an individual's ability to be perceived as native-like (Flege and Liu 2001, Flege, MacKay and Piske 2002). The varying levels of proficiency cause L2 speakers to produce sounds with unequal consistency. According to Wade et al. (2007), this causes "a greater range of acoustic distortion or variability in non-native productions than is found in native productions of speech sounds" (Wade et al. 2007, 123).

Establishing the root causes of accentedness is not enough, however, to help solve the problems experienced with non-native speaker training. Equally important, perhaps, is establishing the native norms that are not being met to cause English listeners' failure to understand foreign-accented speakers. L1 inventory has been shown to influence a learner's ability to create the phonemes in the L2 (Flege 1987) and since the current experiment focuses on Spanish-accented speech in English, only the relevant differences between these two particular languages will be discussed here.

There are many acoustic distinctions between Spanish and English including a shorter voice-onset time in Spanish and longer closure duration for flaps (Shah 2004).

However, the most significant differences may be in the vowels of the two languages. In comparison to English, the 5-vowel inventory in Spanish is very small. Additionally, unlike English, Spanish does not utilize vowel length to differentiate between vowels. Spanish speakers instead rely only on distinctions in high/low and front/back tongue position. Wade et al. (2007) measured height and backness in tokens of native and non-native English vowel productions and found that "non-native productions were robustly more variable in each of these dimensions" (Wade et al. 2007, 142). This difference is likely the cause of distortions in many of the productions of English by native Spanish speakers. Fox, Flege and Munro (1995) proposed that vowel duration might be the single most important factor in English listeners' comprehension of Spanish-accented speech. In an examination of English produced by L1 Spanish speakers, Shah (2004) found that learners failed to differentiate between the tense and lax vowels. Their failure to distinguish the two vowel types resulted in much longer durations not only for the lax vowels but also for the words in general.

In order to accurately describe the differences between native and non-native speaking groups, it is important to consider how native English speakers perform in the environments similar to those to be used in training. There are, for example, considerable differences between vowels produced in isolated words and those that are part of connected speech. Erickson (2000) showed that although vowels are typically shorter in connected speech, there are additional factors that determine vowel length, including a vowel's position in a word and that word's position in the

sentence. Also, English speakers have been shown to significantly lengthen vowels in word final position compared to those in the rest of the sentence (Erickson 2000, Umeda 1975).

II. PREDICTIONS

The current experiment was conducted in order to test whether the sentence-level improvements shown in Weil (2001) could be found with either word-only or sentence-only training in a high-variability format. Native accent training has shown the high-variability paradigm to be effective in perception training. There is reason to believe that the same methods, employed with non-native speech, should be equally effective. If learners are "normalizing" the incoming speech signal and utilizing exemplars of each category, continued exposure to a particular foreign accent should help establish this category.

Whereas early perception studies targeted specific phonemes, /l/ and /r/ for example, the goal of non-native training has been to establish numerous category extensions. When single words are produced by speakers used in training they are likely to be produced in a fairly slow and deliberate manner regardless of the researcher's instructions. Unfortunately, this may eliminate much of the variation actually present in the speaker's daily use of their L2. Words produced in a connected, sentential environment, on the other hand, are anticipated to contain the characteristics that better typify foreign-accented speech (Shah 2004). The failure of Wade et al. (2007) to find significant improvement may have resulted not from the

amount but rather from the type of variability produced in single word tokens compared to the variation likely to be produced in a sentential context. This disparity would also explain the differences found in Weil (2001) between the results of word and sentence-level testing.

It is expected that the three groups involved in current testing will show different levels of improvement. Simple exposure to the testing procedure in the pretest phase is expected to result in a small improvement for the control group in both the word and sentence tasks. The word-level training group is also expected to show improvement. Although the phonetically balanced list task failed to show significant performance increases in either Weil (2001) or Wade et al. (2007), the narrowing of speakers to a single country of origin in high variability training should increase the potential for improvement. Therefore, in addition to the improvement expected from exposure, an additional improvement is expected from pretest to post-test for the word training group with the lone accented speaker presented in both tests. The members of the sentence-level training group are anticipated to show the greatest increase in perceptual ability as a result of the sentence-level stimuli providing the optimal level of phonetic contrasts in pseudo-naturally produced speech.

Following the results of Weil (2001), an improvement of approximately 15% is expected on sentence tasks for the sentence-training group from pretest to post-test with speaker #1. Furthermore, it is expected that similar gains will take place in the word task. Since speaker #6 is novel, it is impossible to show improvement that is due only to training from pre to post-test. However, similar differences are expected

between the groups. Therefore, it is anticipated that the sentence-training group will be the most accurate in both word and sentence contexts, followed by the word-training group and finally the control group.

III. EXPERIMENT

A. Method

1. Stimuli

The stimuli for this experiment were taken from Egan (1948) wherein twenty phonetically balanced (PB) lists of fifty monosyllabic words were developed to represent the English language as a whole. Each list is comprised of the approximate percentage of initial, medial and final vowel sounds in American English. Vowels are further divided into long, short and diphthongs. Consonants are separated into voiced stops, unvoiced stops, nasals, semivowels and fricatives in both initial and final position. Because each list has words that vary in degree of familiarity, many of the words deemed by the investigator to be the most problematic were eliminated. This was done to remove words that would be completely unfamiliar to the non-native speakers and might, therefore, result in a complete mispronunciation instead of accented speech. Furthermore, unknown words may have necessitated an initial production by the investigator causing words to be mimicked rather than produced naturally by the speakers.

In order to retain Egan's (1948) phonetic balance, each word in each of his twenty lists was analyzed and its component segments tabulated. Each list was then

structured such that the phonetic distribution was still intact. In the end, twenty words were eliminated from each list, resulting in twenty lists of thirty words. The remaining word lists comprised the single word training and testing materials. With the exception of short vowels in final position, which do not occur in English but are listed by Egan as making up 4% of the overall total, the reconstructed lists retained Egan's intended ratio within 3.7%. Egan (1948) does not specifically explain his decision to include the category of short vowels in final position. Table 1 shows the frequency of occurrence, by phonetic class, in both Egan's original lists and those in the current experiment. The numbers on the left side of each column represent those in Egan (1948) while those on the right represent the current experiment.

Position of Sound in Word								
Phonetic Class	Initial			Medial			Final	
VOWELS	E	K		E	K		E	K
Long	4%	5.8%		32%	32.3%		4%	5.7%
Short	4%	4.2%		40%	40.7%		4%	0%
Diphthong				12%	10.7%			
CONSONANTS								
Nasal	10.8%	7.6%					10.8%	12.4%
Semivowel	19.6%	18.3%					19.6%	16.4%
Fricative	26.1%	30.8%					26.1%	27.4%
Voiced Stop	19.6%	19.6%					19.6%	17.1%
Unvoiced Stop	23.9%	23%					23.9%	25.7%

Table 1: Frequency of occurrence of phonetic classes in both Egan (1948) represented with E and Kasparek represented with K

In order to create the stimuli for the sentence-level training, sentences were generated utilizing the monosyllabic words used in the previous stimulus set. The thirty words from each list were placed into syntactically well-formed sentences that were semantically meaningless. The constructed sentence lists contained between nine and eleven sentences depending on the number of target words used in each sentence. According to Nye and Gaitenby (1974), the use of semantically anomalous sentences reduces the ability of listeners to simply rely on word identification cues.

In many cases it was necessary to include additional words in the sentences in order to retain well-formed syntax. The added words were limited to the function

words ‘a’ and ‘the’, the pronouns ‘you’ and ‘they’ and the verbs ‘is’ and ‘are’. It is important to note that each of the words, with the exception of ‘a’ and ‘the’, was also presented in the single word stimuli. This greatly limits the potential for the sentence-level training group to benefit simply from additional stimuli. The following examples are sentences that were used in testing. The target words are underlined here but were not underlined in the actual recording process.

The purse shot the rice.
Most doubt the arm.
They sing the news.

See appendix A for a complete list of sentences used in training

2. Speakers

A total of six speakers were recorded. All speakers were born in Mexico and had learned English as a second language. Speakers were paid $10 for their participation. The following table summarizes the pertinent background information for each speaker.

Speaker	Age	Sex	Country of origin	First Language	Age started learning English	Years in United States	Languages Known other than English
1	27	F	Mexico	Spanish	15	4	None
2	29	F	Mexico	Spanish	17	6	French, Portuguese
3	41	M	Mexico	Spanish	34	8	None
4	24	F	Mexico	Spanish	14	2	None
5	32	M	Mexico	Spanish	29	3	None
6	22	F	Mexico	Spanish	7	4	None

Table 2: Background information of speakers used in study

3. Recording

All speakers were recorded on a Marantz PMD671 solid-state recorder. Speakers 1, 4 and 6 were recorded in the Anechoic Chamber on the campus of The University of Kansas using an Electro-Voice RE20 microphone. Speakers 2, 3 and 5 were recorded in quiet conditions in Phoenix, Arizona using an Electro-Voice N/D 767a microphone.

Each speaker read all twenty word lists and sentence lists one time and was instructed to do so at a conversational pace. All recordings were made in numerical order starting with word lists followed by sentences. Each recording session took approximately one hour which included time to look over each list before beginning recording.

4. Subjects

Forty-two University of Kansas undergraduates (20 male, 22 female) participated as listeners in the experiment for extra class credit. Two participants

were excluded for failure to complete the training sessions in the required amount of time. Of the remaining 40 participants (20 male, 20 female), 37 were monolingual English speakers, 2 were bilingual English and Spanish speakers and one was a native Chinese speaker who was determined by the researcher to be highly proficient in English. The bilingual speakers were not excluded from the final analysis because their results were in line with the other participants, suggesting that their knowledge of Spanish did not provide a significant pre-training advantage. None of the participants reported any history of hearing disorders at the time of testing.

5. Training

Prior to testing and training, recordings of all six speakers were presented to five naïve English listeners not involved in the experiment. Listeners were asked to rate each of the speakers on accentedness and how difficult each speaker was to understand with both single words and sentences. After combining the results from each of the categories it was determined that speaker #1 and speaker #6 were in the middle of the range for both measures. It was decided, therefore, that the two speakers reported to be the most difficult to understand and the two speakers reported to be the easiest to understand would be included in training but not in testing.

Participants were randomly assigned to one of three groups: control (n=13), word training (n=14) or sentence training (n=13). All groups were given a pretest that consisted of two PB lists and two sentence lists spoken by speaker #1. The word-training and sentence-training groups then underwent three sessions of high-

variability training within five days. The word-training group listened to two word lists spoken by speakers 1-5 for a total of 300 words per day. The sentence-training group listened to two sentence lists spoken by speakers 1-5 resulting in approximately 100 sentences per day. Each sentence contained approximately three target words. The ten lists used in training were rotated so that listeners never heard a list spoken by the same speaker twice. The order of speakers and lists presented was kept constant across groups and is shown in Table 3. On days 1 and 5, the numbers in the top row of each box are the PB word lists that were administered during testing while the numbers in the bottom row of each box are the sentence lists used in testing. For days 2-5, the numbers represent both the word lists and sentence lists presented to the respective training groups.

	Day				
Speaker	**1 (pretest)**	**2**	**3**	**4**	**5 (post-test)**
1	6,7	1,2	9,10	3,4	11,12,6
	5,8				13,14,5
2		3,4	5,6	7,8	
3		5,6	7,8	9,10	
4		7,8	3,4	1,2	
5		9,10	1,2	5,6	
6					15,16,7
					17,18,8

Table 3: Testing and training schedule for all groups used in the experiment including the PB or sentence lists utilized each day.

Following training, all three groups took a post-test. The post-test consisted only of speakers #1 and #6. Speaker #1 had been used in the pretest and in training while speaker #6 had previously never been heard. Listeners were tested on two

novel word lists (11 and 12 for speaker #1, 15 and 16 for speaker #6) and two novel sentence lists (13 and 14 for speaker #1 and 17 and 18 for speaker #6) per speaker. Additionally, they were tested on one word list and one sentence list that had been utilized in the pretest and in training.

6. Procedure

Participants were seated in a quiet testing room in front of a computer keyboard and screen. In each session, up to four participants were run concurrently in separate booths at their own pace. Participants wore Sony MDR-7502 dynamic stereo headphones and were presented the materials on Dell GX-270 computers using the Paradigm software package.

During the pretest and post-test phase, listeners were presented instructions on the computer screen and then asked to hit the space bar to begin. Participants saw a blank screen and heard a single word. Participants then transcribed in regular orthography exactly what they had heard onto paper that had been provided for them. Once they had finished writing, they pressed the space bar to advance to the next word. After thirty words had been presented, a screen appeared explaining that they would now be hearing sentences. Following a prompt that they should ask any questions they had and to press the space bar to continue, the same procedure that had been utilized with single words took place with sentences. This process was repeated until all word lists and sentence lists used in testing were completed. All stimuli were blocked by speaker and by words or sentences.

During the training phase, stimuli were similarly blocked by speaker. The word training group, for example, heard two word lists by speaker #1 followed by two word lists spoken by speaker #2, then two word lists by speaker #3, etc. The same order and procedure was followed by the sentence training group. During training, feedback was presented following each transcription. Listeners would hear each word or sentence, transcribe it and then press the space bar. When the space bar was pressed, listeners heard the word or sentence again while the written stimulus was simultaneously shown on the computer screen. The pretest took approximately fifteen minutes while each training session and the post-test took approximately thirty minutes each.

B. Results

Responses were counted as correct when they exactly matched the intended target word or sentence. Responses that were homophones of the target ("tow" versus "toe") were also counted as correct since there were no semantic clues given in the context of the sentence. Misspelled words were judged as correct only if the intended meaning was clear ("forse" versus "force"). All other responses were judged as incorrect. In sentence testing, only the target words were analyzed.

Multiple comparisons were needed in order to evaluate and compare each group's results both from pretest to post-test with the familiar speaker and results with the novel speaker. It was also necessary to consider whether listeners heard

novel words, words previously heard in training, novel sentences or sentences that had been heard in training. Each condition will be addressed separately.

1. Pretest to Post-test Comparison

The following four graphs represent pre and post-test data for all three groups involved in the study. In each case a separate 2 (testing) x 3 (training) repeated measures ANOVA was run. Training categories remain constant throughout but the graphs vary as a function of the testing materials in the pre and post-test. Figure 1 shows the results when listeners were tested on the same word list at pretest and post-test while Figure 2 contains the comparison of all word lists at pretest compared to novel word lists presented in the post-test. Figure 3 shows the results when listeners were tested on the same sentence list at pretest and post-test and Figure 4 contains the comparison of all sentence lists at pretest compared to novel sentence lists presented in the post-test.

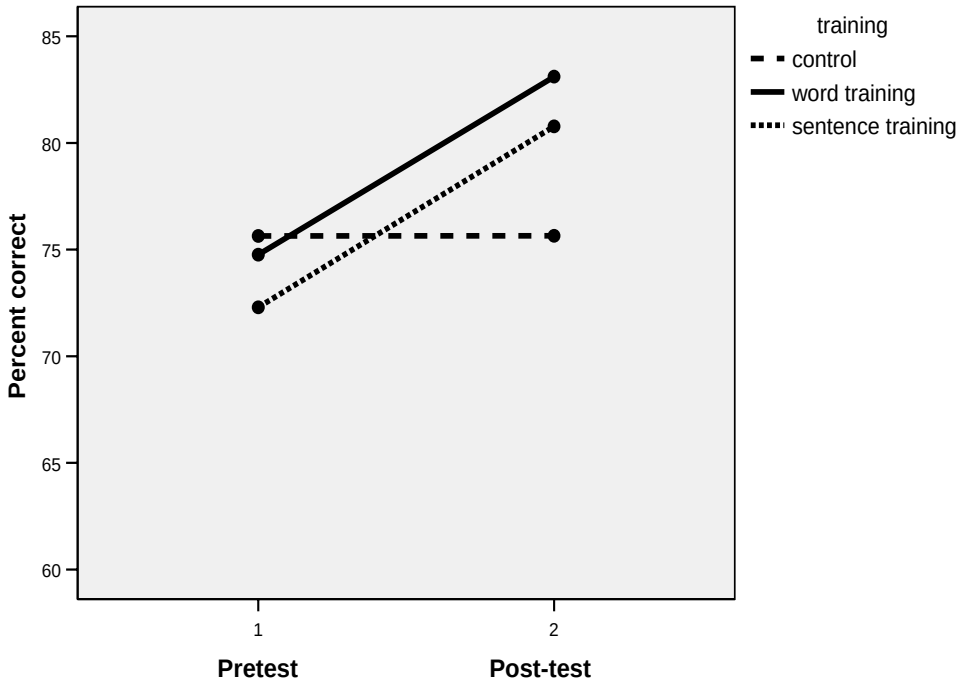

Figure 1: Results for word list #6 at pretest and at post-test with speaker #1

Figure 1 shows the comparison between training groups on speaker #1 with a single word list (#6) at pretest and the same list presented at post-test. The main effect for Testing was significant [$F(1,37)=31.57$, $p=0.000$] but the main effect for Training was not [$F(2,37)=1.92$, $p=0.161$]. A significant interaction between them was established [$F(2,37)=7.78$, $p=0.002$], indicating that the two training methods were equally effective in producing gains from pretest to post-test and that both were more effective than no training.

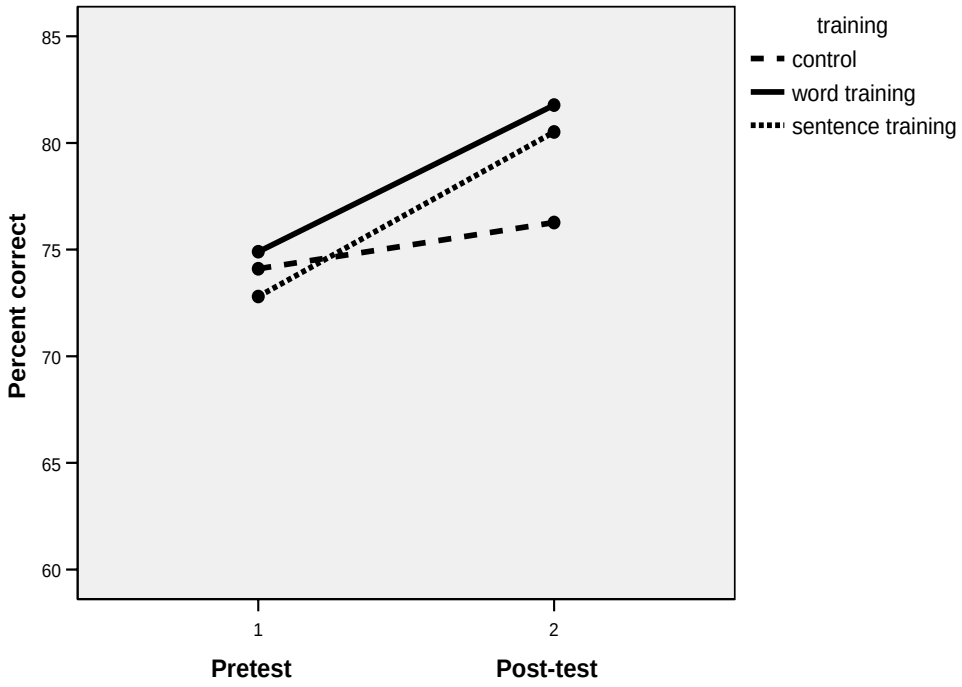

Figure 2: Results on word lists at pretest and novel word lists at post-test with speaker #1

A comparison of performance on individual words spoken by speaker #1 at pretest and novel words at post-test is shown in Figure 2. A main effect of Testing was observed [$F(1,37)=28.95$, $p=0.000$] but a main effect for Training was not [$F(2,37)=1.80$, $p=0.180$]. However, the interaction between Testing and Training revealed a strong trend, indicating that both word and sentence training were more effective than no training and that the two types of training seemed equivalent [$F(2,37)=2.72$, $p=0.079$].

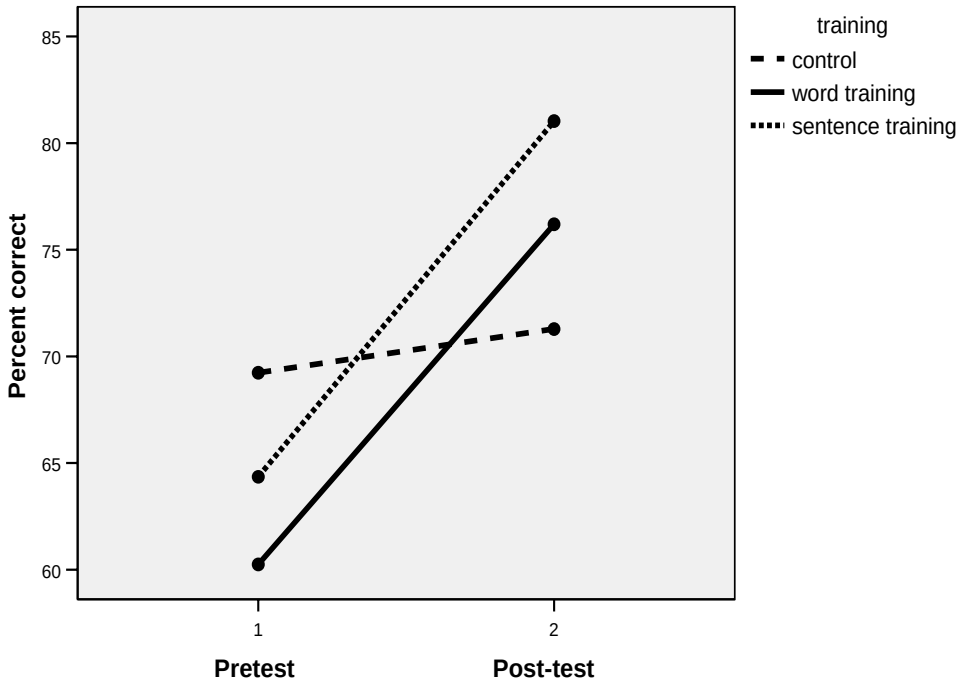

Figure 3: Results for sentence list #5 at pretest and at post-test with speaker #1

Figure 3 shows the results of training groups on speaker #1 with a single sentence list (#5) at pretest and the same list presented at post-test. A main effect was found for Testing [$F(1,37)=109.43$, $p=0.000$] but not for Training [$F(2,37)=1.27$, $p=0.292$]. A significant interaction [$F(2,37)=18.29$, $p=0.000$] was found which again suggests that the two training methods were sufficiently better than no training for improving perception of a foreign accent but that neither method was significantly better than the other.

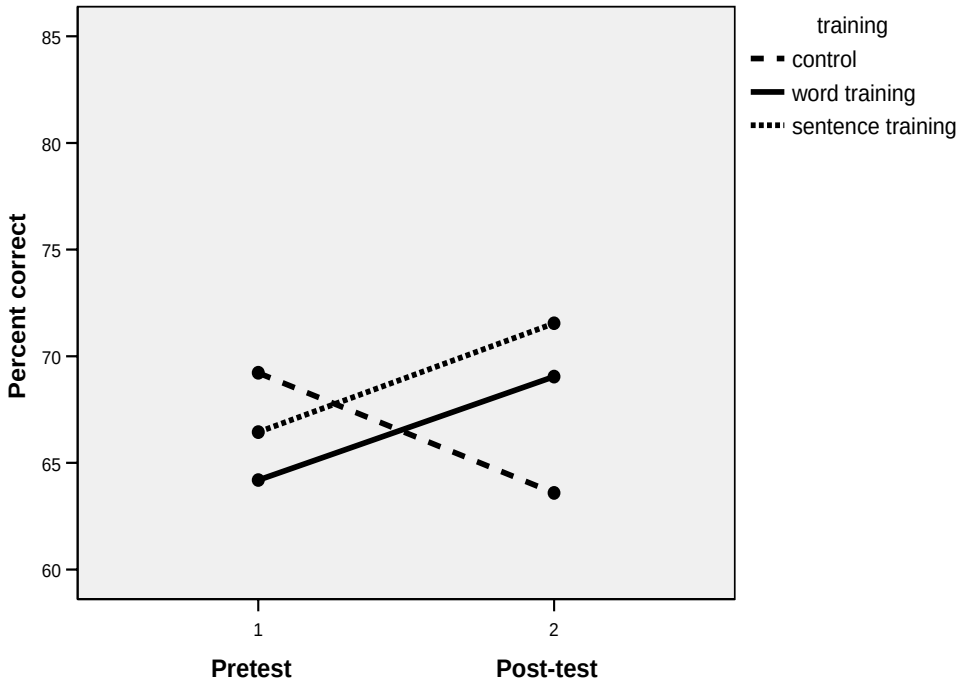

Figure 4: Results on sentence lists at pretest and novel sentence lists at post-test with speaker #1

A comparison of participants' results with speaker #1 on sentences in pretest and with novel sentences at post-test is shown in Figure 4. No significant main effect was found for either Testing [$F(1,37)=2.01$, $p=0.164$] or Training [$F(2,37)=0.847$, $p=0.437$]. There was, however, a significant interaction between Testing and Training [$F(2,37)=11.95$, $p=0.000$], meaning the two training groups again improved in a similar fashion compared to the control group. The control group's decrease in accuracy from pretest to post-test likely contributes to the failure to find an effect for Testing and Training individually.

When all four pretest to post-test measures are examined as a group consistent patterns emerge. The most important is the significant interaction between training and testing that exists in both word and sentence testing. This shows that training, whether with words or with sentences, provides the listener with a reliable advantage over individuals who did not undergo any type of training.

2. Post-test Comparisons

In addition to changes in accuracy from pretest to post-test, it was also necessary to examine how the individual groups performed in the post-test alone. In order to make the comparisons separately, a one-way ANOVA was run on each of the post-test conditions. The eight conditions are familiar speaker (#1) with previously heard word list (list #6) (Figure 5), familiar speaker with novel words (Figure 6), novel speaker (#6) with previously heard word list (list #7) (Figure 7), novel speaker with novel words (Figure 8), familiar speaker with previously heard sentence list (list #5) (Figure 9), familiar speaker with novel sentences (Figure 10), novel speaker with previously heard sentence list (list #8) (Figure 11) and novel speaker with novel sentences (Figure 12).

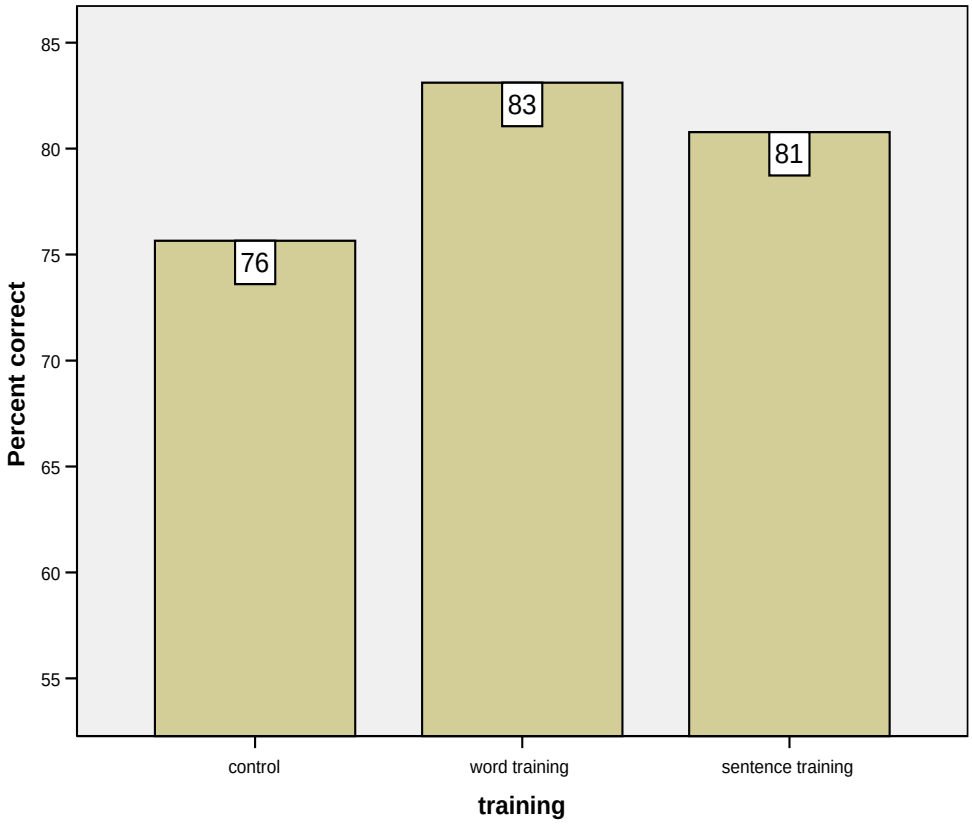

Figure 5: Post-test results of training groups with familiar speaker and familiar words

Figure 5 shows the performance of the individual groups when there was a familiar speaker and familiar words that had been heard in the pretest and in training (list #6). A significant difference was found between the groups [$F(2,37)=7.19$, $p=0.002$]. A Bonferroni post-hoc comparison revealed that both training groups were significantly more accurate than the control group. Word training compared to the control ($p=0.002$) and sentence training compared to the control ($p=0.049$) were both significant but a comparison between the two training groups was not ($p=0.757$).

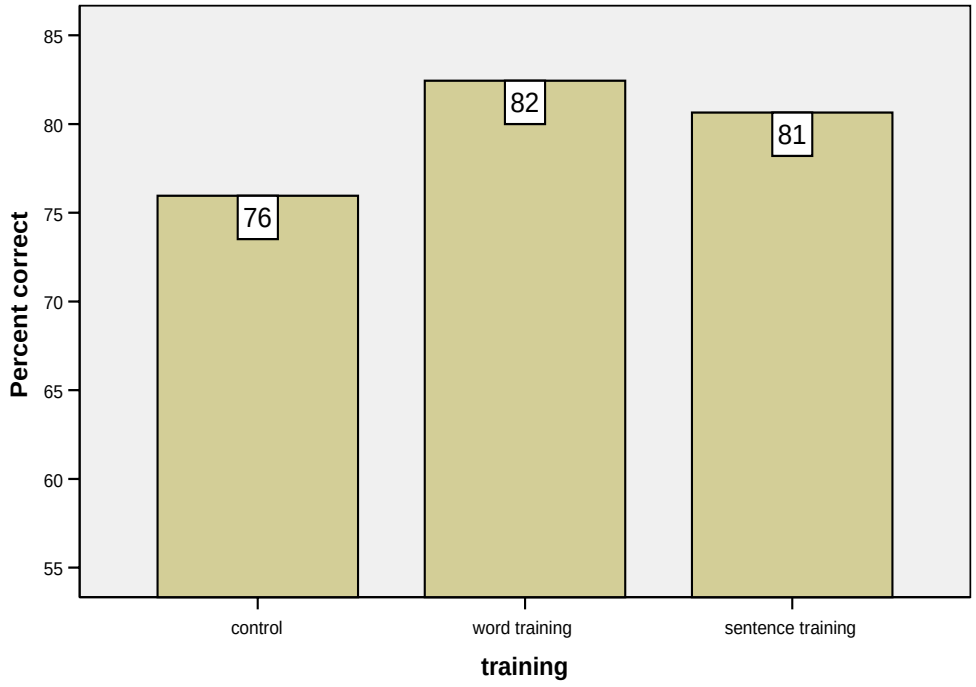

Figure 6: Results of training groups with familiar speaker and novel words

The mean accuracy scores for each group with the familiar speaker reading a novel word list are shown in Figure 6. Although both training groups outperformed the control group, the results were not quite significant [$F(2,37)=2.75$, $p=0.077$].

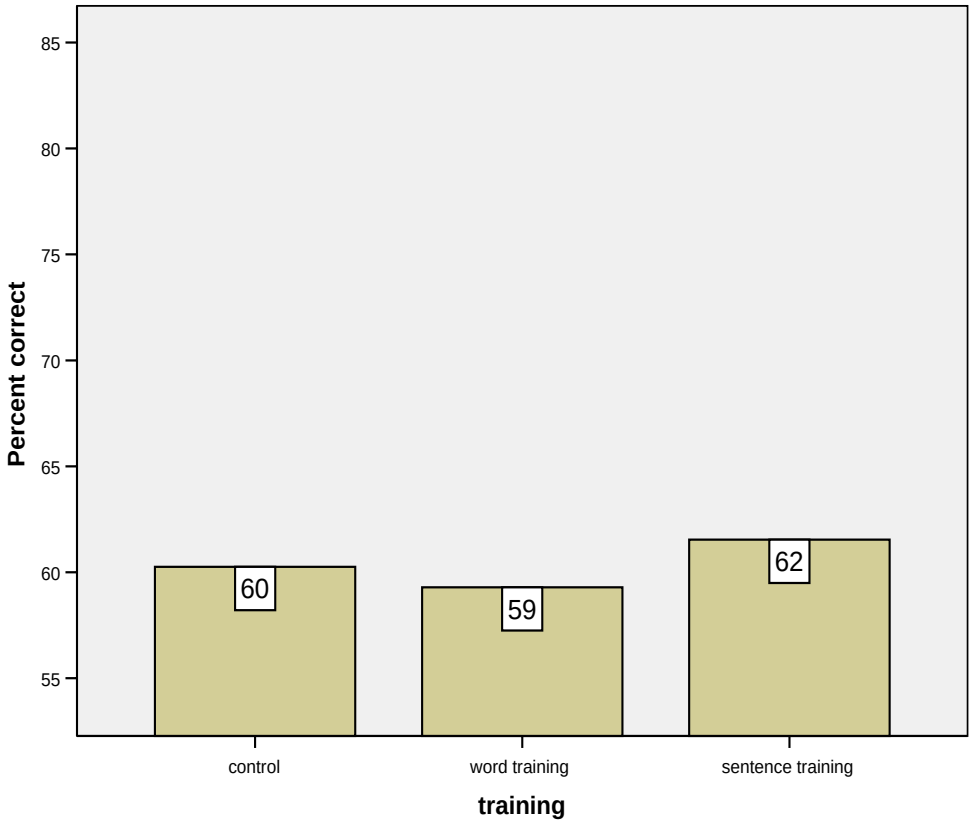

Figure 7: Results of training groups with novel speaker and familiar words

The results for the three groups when listening to a novel speaker read a familiar word list (list #7) are shown in Figure 7. No significant difference was found among the training and control groups [$F(2,37)=0.354$, $p=0.704$].

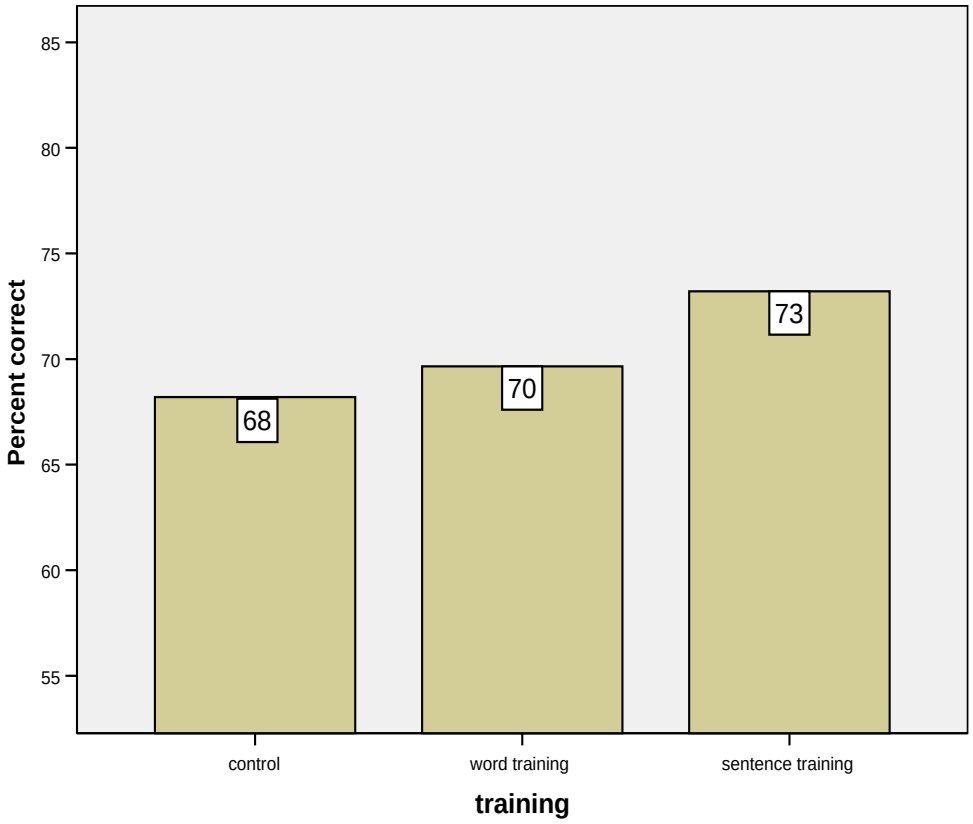

Figure 8: Results of training groups with novel speaker and novel words

Figure 8 shows the accuracy rates of the three groups when they were presented with novel words spoken by a novel speaker. The sentence training group performed slightly better than the other two groups but no significant difference was established [$F(2,37)=2.07$, $p=0.141$].

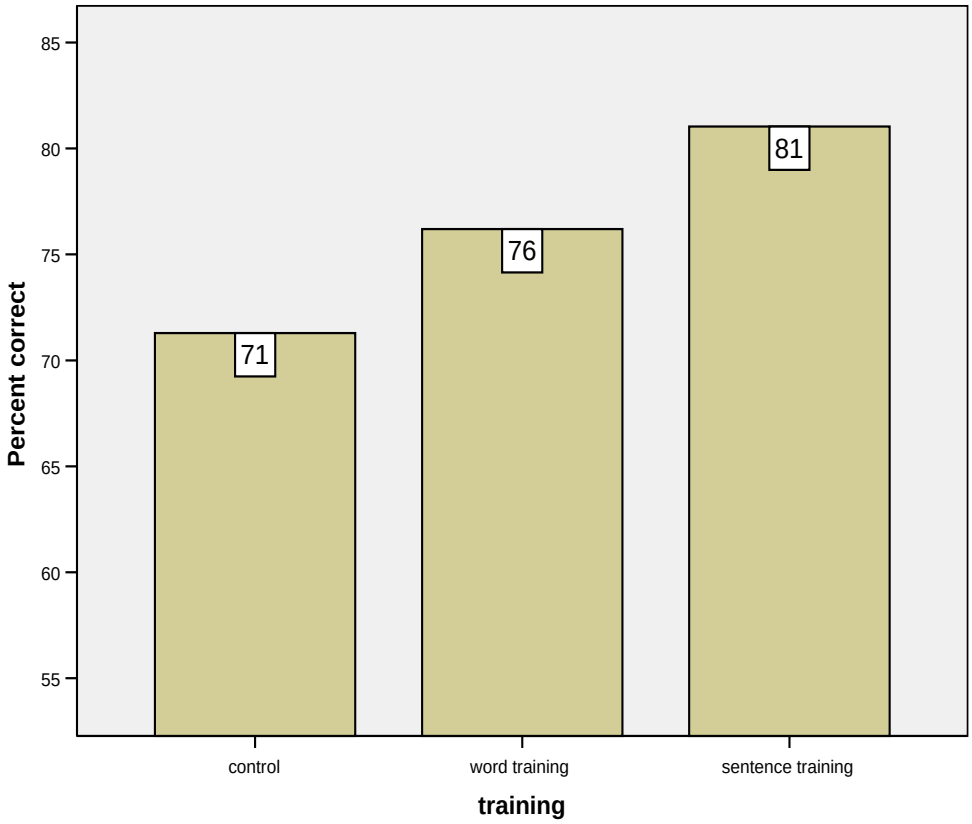

Figure 9: Results of training groups with familiar speaker and familiar sentences

Figure 9 shows the results of each group when the familiar speaker read the familiar sentence list (list #5). A significant difference between the groups was found to exist [$F(2, 37)=5.75$, $p=0.007$]. The results of a Bonferroni post-hoc test revealed the sentence training group to have a significant advantage over the control group ($p=0.005$) but not the word training group ($p=0.285$). No significant difference was found between the word training group and the control group ($p=0.271$).

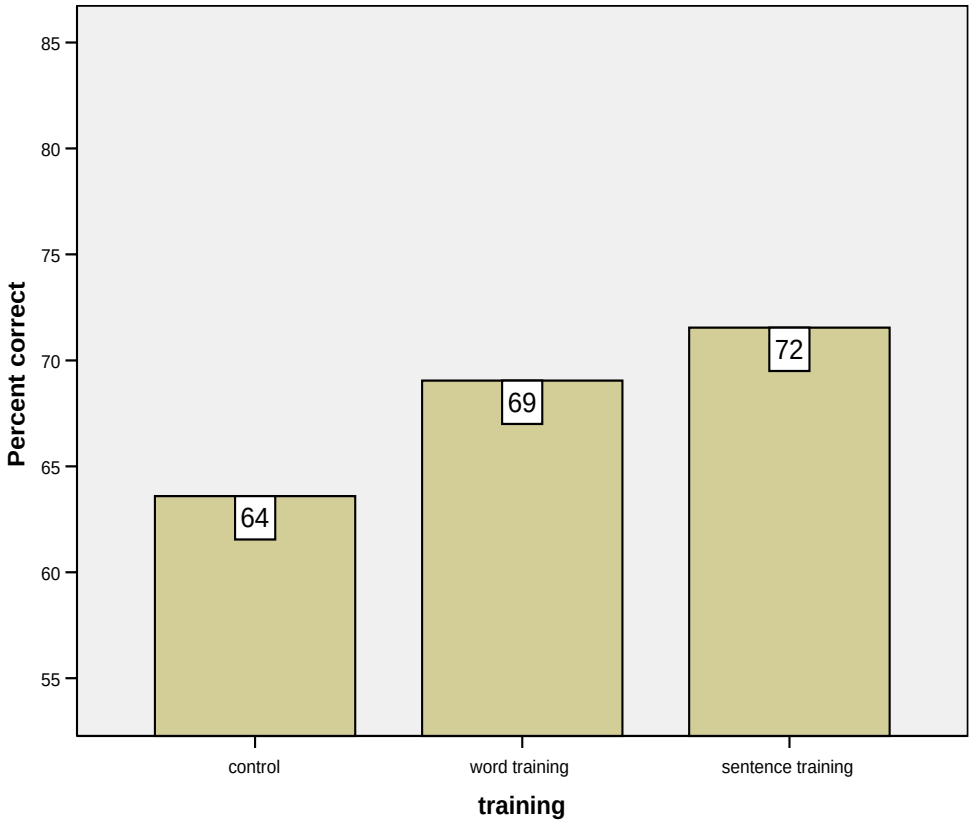

Figure 10: Results of training groups with familiar speaker and novel sentences

A comparison of performance with a familiar speaker saying novel sentences is shown in Figure 10. Similar to the previous comparison with a familiar speaker, a significant difference was found between the groups [$F(2,37)=5.98$. $p=0.006$]. Once again, it was the sentence training group that, according to a Bonferroni post-hoc test, was significantly different than the control group ($p=0.005$) but not the word training group ($p=0.858$). The word training group shows a strong trend towards a difference compared to the control group ($p=0.071$).

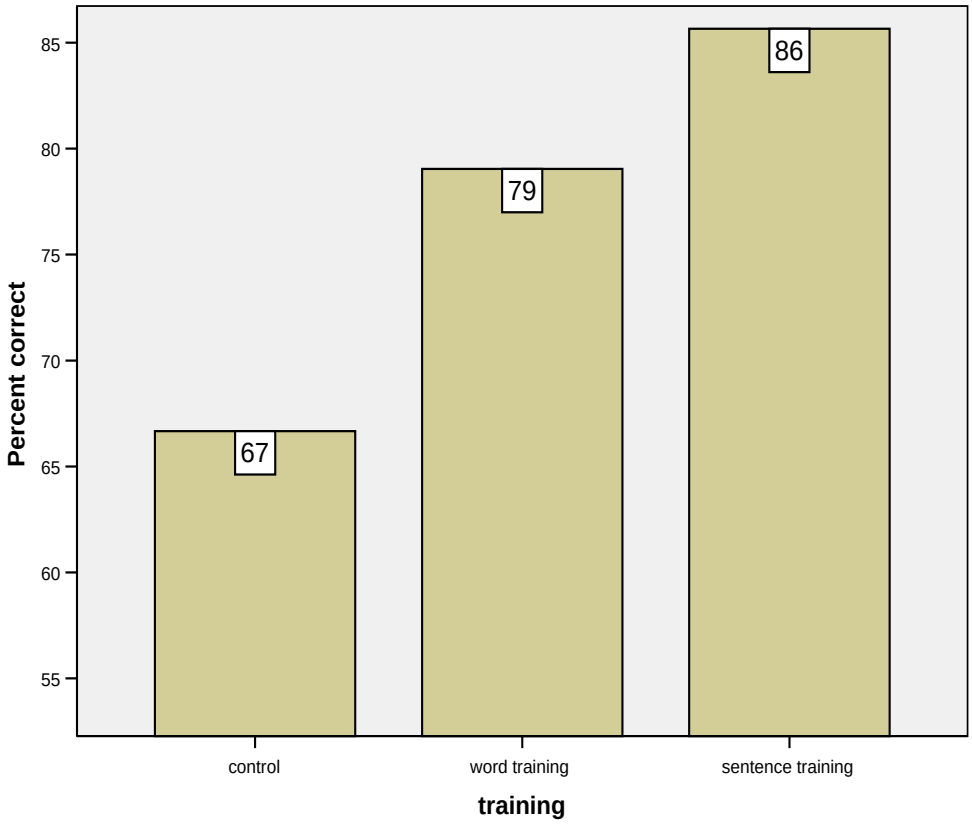

Figure 11: Results of training groups with novel speaker and familiar sentences

Figure 11 shows a comparison between the groups when familiar sentences (list #8) were spoken by a novel speaker. A significant difference [$F(2,37)=13.44$, $p=0.000$] was shown to exist between the groups. A Bonferroni post-hoc test revealed a significant difference between the sentence-training group and the control group ($p=0.000$) and between the word-training group and the control group ($p=0.005$). No significant difference was found, however, between the two training groups ($p=0.235$).

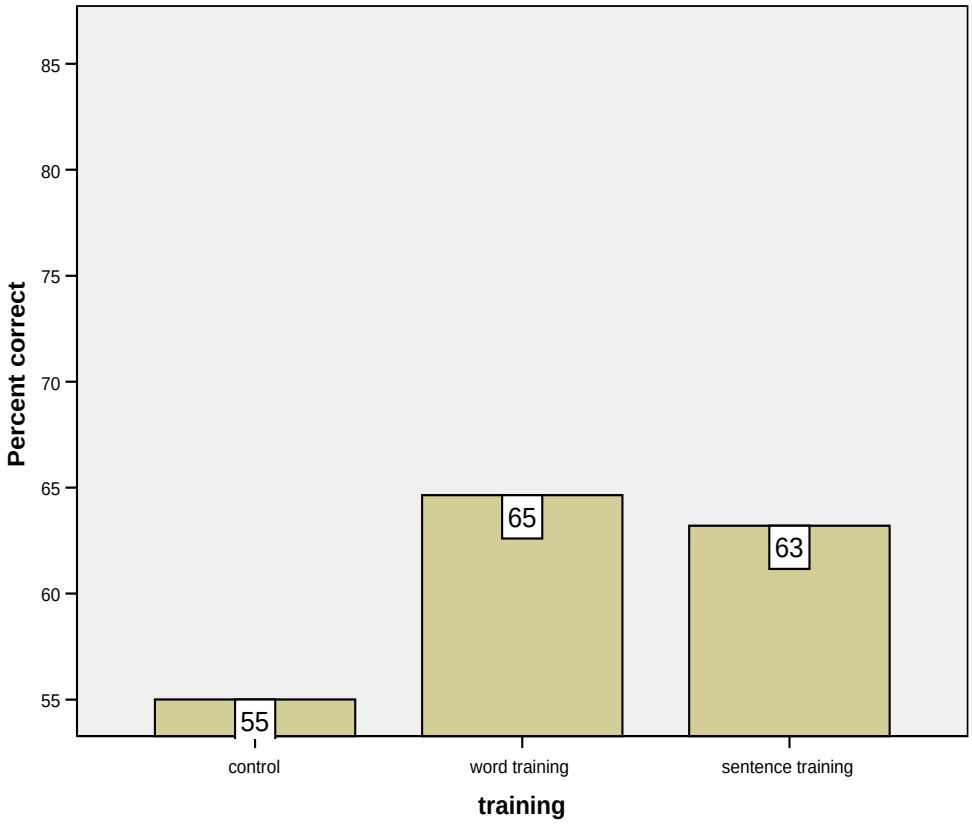

Figure 12: Results of training groups with novel speaker and novel sentences

The final graph, Figure 12, shows the accuracy of the groups when novel sentences are presented by a novel speaker. Once again a significant difference was found to exist [$F(2,37)=9.10$, $p=0.001$]. A Bonferroni post-hoc test showed that the sentence training group performed significantly better than the control group ($p=0.006$) as did the word training group ($p=0.001$). No difference was found to exist between the two training groups ($p>.99$).

3. Post-test Comparisons across Type of Stimuli

The following three graphs present the findings at post-test when the results are grouped by type of stimuli. Figure 13 shows a comparison of performance for the three groups when all post-tests on words are combined and all post-tests on sentences are combined. Figure 14 shows the results of the training groups when all post-tests involving the familiar speaker are compared to all post-tests involving the novel speaker. Figure 15 compares the results of the training groups when they were tested on either familiar word and sentence lists or novel word and sentence lists.

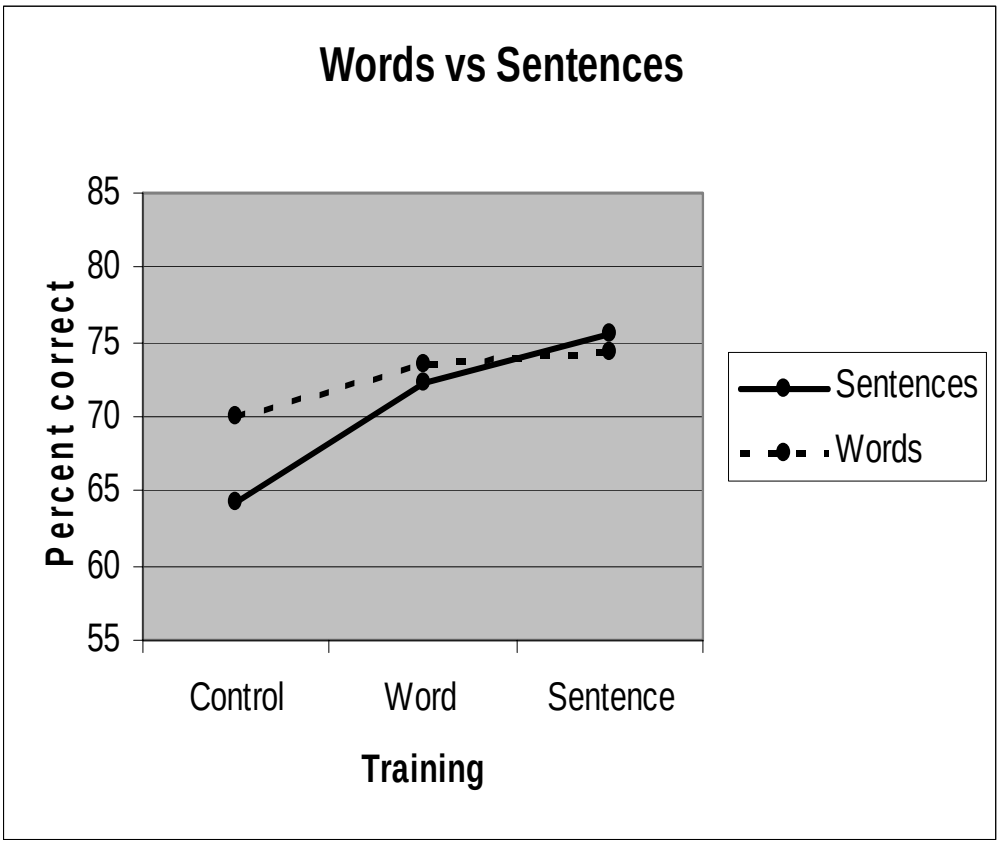

Figure 13: Results of training groups when all post-test measures are collapsed into either word or sentence testing.

Figure 13 shows the results at post-test for all word lists and all sentence lists. The word lists include the familiar speaker with familiar words (Figure 5), the familiar speaker with novel words (Figure 6), the novel speaker with familiar words (Figure 7) and the novel speaker with novel words (Figure 8). The sentence lists include the familiar speaker with familiar sentences (Figure 9), the familiar speaker with novel sentences (Figure 10), the novel speaker with familiar sentences (Figure 11) and the novel speaker with novel sentences (Figure 12). The graphs include the results of the control group but when each ANOVA was run, the control group was

excluded. The results of a 2-way ANOVA (Testing x Training) failed to show either a main effect for the type of testing [F(1,25)=.007, p=0.925] or a main effect for the type of training [F(1,25)=1.96, p=0.174]. While a significant interaction between training method and testing method was not shown a strong trend does exist [F(1,25)=2.94, p=0.099].

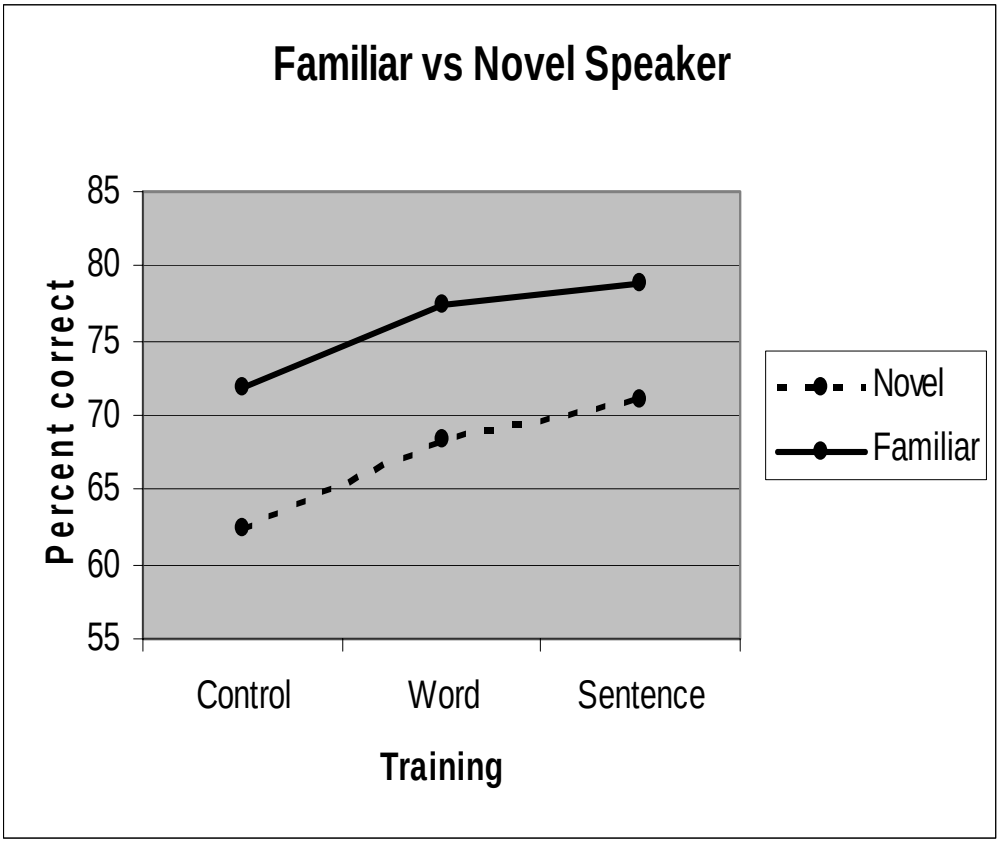

Figure 14: Results of training groups for all post-tests involving either the familiar or novel speaker.

Figure 14 shows the results of all post-test measures separated by speaker. The post-tests involving the familiar speaker are familiar words (Figure 5), novel

words (Figure 6), familiar sentences (Figure 9) or novel sentences (Figure 10). The post-tests involving the novel speaker are familiar words (Figure 7), novel words (Figure 8), familiar sentences (Figure 11) and novel sentences (Figure 12). Results of a 2-way ANOVA (List x Training) showed a significant difference between the results for the familiar speaker compared to the novel speaker [$F(1,25)=147.64$, $p=0.000$]. This shows that all of the groups consistently performed better with the familiar speaker than with the novel speaker. No main effect was found for type of training [$F(1,25)=1.96$, $p=0.174$] and no significant interaction was found to exist between the speaker and the type of training [$F(1,25)=1.68$, $p=0.207$].

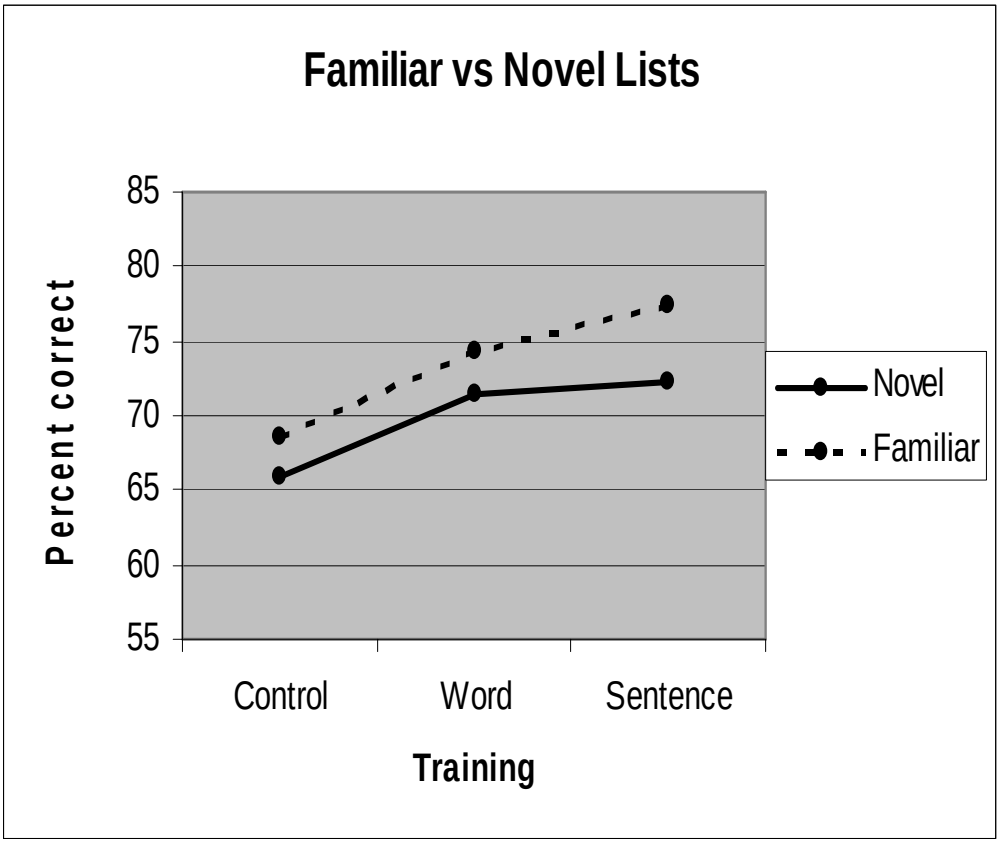

Figure 15: Results of training groups for all post-tests involving either the familiar or novel stimuli lists.

Figure 15 shows the results at post-test for all lists when separated into either familiar or novel lists. The familiar lists are familiar speaker with familiar word list (Figure 5), novel speaker with familiar word list (Figure 7), familiar speaker with familiar sentence list (Figure 9) and novel speaker with familiar sentence list (Figure 11). The novel lists are familiar speaker with novel word list (Figure 6), novel speaker with novel word list (Figure 8), familiar speaker with novel sentence list (Figure 10) and novel speaker with novel sentence list (Figure 12). Following a 2-way ANOVA, a main effect for type of stimuli list was observed [$F(1,25)=22.92$,

p=0.000] but a main effect for type of training was not [F(1,25)=1.96, p=0.174]. No significant interaction was found [F(1,25)=1.31, p=0.264]. These results show that the groups were more accurate when the lists had been previously heard in testing and training than they were when the testing lists were novel.

IV. DISCUSSION

Previous studies utilizing non-native listeners and native speakers have shown that a high-variability training procedure can drastically improve a listener's ability to accurately understand speakers outside of their L1 (Strange and Dittman 1984, Lively et al. 1993, Bradlow et al. 1997). When the listeners were native speakers and the speakers were non-native, however, the high variability paradigm did not produce equivalent results (Wade et al. 2007). Listeners in Wade et al. (2007) failed to make significant improvements over controls when trained and tested with isolated words. When a low variability paradigm was implemented in Weil (2001), a similar result was found. Namely, listeners were unable to outperform controls when tested on single word tokens spoken by a novel, similarly accented speaker as the speaker used in training. However, Weil (2001) did show that native listeners could improve significantly on the novel speaker when testing consisted of target words presented in sentential contexts.

The central aim of the current study was to extend the findings in Weil (2001) by investigating whether high variability sentence-level training would be more beneficial than high variability word-level training for improving the perception of

foreign-accented speech. Because listeners in Weil (2001) were trained with both sentences and single words using a variety of training methods, it is impossible to discern whether a particular type of training input yielded the significant results or if a combination of the employed methods was responsible. In order to tease the two training methods apart, listeners in the current experiment were trained either only with single word tokens or only with sentences. A control group was also included to determine if any gains found at post-test were merely the result of familiarity with the testing procedure. Since high-variability training has been shown to be considerably more effective than low-variability training with non-native listeners, it is the method that was applied here.

The results of the current study demonstrate that the benefits garnered from word-level training can be duplicated and, in fact, can be improved upon with sentence-level training. Listeners who were part of the word-training group showed significant post-test advantages over controls when presented with familiar words spoken by a familiar speaker and with both novel and familiar sentences spoken by a novel speaker. Listeners who made up the sentence-training group also showed significant differences compared to the control group in these tests but also in tests with familiar and novel sentences spoken by a familiar speaker. Notably, the sentence-training group significantly outperformed controls on every post-test measure involving sentences. Taken together, the results prove that there are important differences between the two types of training. Of the most consequence is

the fact that there are additional benefits to be realized when sentence training is the method employed rather than word training.

Although the level of improvement at post-test was not significant in all measures, it is important to note that the daily progress of each training group resulted in changes that are similar in direction and magnitude to the predicted outcome and to those found from pretest to post-test. In order to measure overall gains, the results with all of the speakers used in training were collapsed for each day. The combined percentages show that the sentence-training group performed with 53% accuracy on the first day of training, 61.4% accuracy on the second day of training and 67.6% accuracy on the third and final day of training.

The word-training group also made daily improvements in overall accuracy across speakers but to a smaller extent. The difference in magnitude of the two groups is to be partially expected since the accuracy rate on the first day of training was much greater for single words than it was for the sentences. The first day of word training resulted in 61.4% correct transcription, day two performance was 64.3% correct and day three was 66.3% correct. These results illustrate that although significant gains were not found on post-test measurements with isolated words, listeners were improving as a consequence of each day's training session.

The results of this experiment provide an interesting comparison to the native listener studies by Wade et al. (2007) and Weil (2001). The failure of Wade et al. (2007) to find significant improvement on single word tokens was mirrored in the current experiment. The similarities in findings between the two studies occurred

despite several changes in the amount of daily input that each listener encountered. The number of tokens that each listener in the training groups heard was raised from 200 to 300 target words per session and the number of speakers heard each day was increased from four to five. Furthermore, in addition to the word-only training that participants in Wade et al. (2007) had received, a second group receiving sentence-only training was included. These changes appeared to make little difference. The post-test results for both training groups failed to show significant differences compared to controls on all tests involving isolated words except those spoken by a familiar speaker and used throughout training. Wade et al. (2007) did not run such a post-test so comparisons on that particular measure are impossible to make.

The current experiment also shows parallels to the Weil (2001) study in that listeners who had undergone training were able to significantly outperform controls on sentence-level testing but not on single word testing. By separating the groups into either word-only training or sentence-only training, the numerous training methods that had been conflated in Weil (2001) could be analyzed independently. It is now possible to conclude that sentence training provides the input necessary to result in significant improvements with sentence-level stimuli without the inclusion of single-word training. It is difficult to surmise whether the high-variability paradigm was advantageous compared to the low-variability paradigm employed by Weil (2001) because the results were similar.

There are several possible explanations for the performance of the sentence-training group. One reason may be that they were simply forced to pay closer

attention to the speakers than the members of the word-training group. Transcribing a full sentence, especially when there are no semantic clues to use as an aid, undoubtedly requires greater concentration on the stimuli than transcribing a single monosyllabic word. Retaining the target words until the sentence had been completed also demands that targets be committed to memory, at least in the short term. Conversely, single words can be transcribed almost instantly which allows the listener to essentially repeat the target without significant analysis.

A second possible explanation may involve prosody. According to Weil (2001), "if prosodic aspects of speech (pitch contour, amplitude contour, speaking rate) are encoded into memory, they may affect tasks of different lengths differentially" (Weil 2001, 37). Although speakers in the current experiment were judged by naïve listeners for accentedness and intelligibility, selecting the middle two speakers on these measures to be the familiar and novel speakers may have had the unintended consequence of choosing speakers whose speech is alike on other levels as well. For example, if the familiar speaker had similar stress and intonation patterns to the novel speaker introduced at post-test, the sentence training group would have a distinct advantage in understanding sentence-length utterances as a result of exposure to sentences spoken by the familiar speaker throughout training. It would also explain why they were unable to translate this advantage to tests involving isolated words. Essentially, the single words would not have provided a speech sample large enough for prosodic elements in the signal to be successfully accessed. This scenario seems unlikely to be the singular cause of the difference in performance between the

two training groups, however, because the word training group was also able to significantly outperform the controls in sentence testing with a novel speaker despite receiving little additional prosodic information through training.

A third account lies in the type of phonetic stimulus that each group received. Although the target words were identical in both training methods, the effects of progressive and regressive assimilation on consonants occurred only with sentence training. Assimilation across word boundaries did not occur in word training as only isolated monosyllabic words were used. As a result, single words produced fewer variations of each phoneme than were available in the sentence-level stimuli. The additional contexts, therefore, may have extended the exemplar range and allowed the inclusion of a wider array of possible pronunciations. While this rationalization would help explain improvements with consonants, it does not clarify improvements made with vowels.

An account for improvements that may have been made on vowels might reside in the fact that when the stimulus is sentential, listeners are able to utilize those vowels that had been presented earlier in the sentence to process subsequent vowels. This would be particularly useful when the same vowel is present in two different locations in the sentence. In the post-test sentence “the itch bit the ditch”, for example, the phoneme /I/ in “itch” may facilitate the decision that the second target word is “bit” rather than “beat”. Continued exposure to sentences of this type would undoubtedly lead to marked improvements with words that are minimal pairs with regards to vowels in English.

The most probable explanation, however, is that listeners in the sentence-training group utilized a combination of these factors to improve their overall accuracy scores. According to Clarke and Garrett (2004), "using sentences rather than isolated words more closely matches conversational language and allows for the influence of all phonological aspects of accented speech, including interword phonetic context effects and prosodic patterns" (Clarke and Garrett 2004, 3649). Hearing the 'conversational language' of six similarly-accented speakers in an environment where concentration was necessary likely required listeners to employ all the resources and strategies available.

The present experiment illustrates that high variability training can be a useful tool in the training of native listeners with foreign-accented speakers. This is particularly true when the stimuli are sentential in length. The members of the sentence training group were not only able to improve their ability to understand a single accented speaker but were also successful at applying the training to a novel speaker with a similar accent and novel stimuli. A future study that directly compares the high-variability and low-variability methods using identical stimuli will be necessary to discover which is more advantageous in non-native accent training.

Another logical step in future foreign-accent training will be to discover when significant improvements are being made. While three days of high variability training in the present study is sufficient for improvements to occur, it may be more than is required. Clarke (2002) and Clarke and Garrett (2004) both showed that adaptation to a single foreign-accented speaker can occur in a very short amount of

time. In Clark (2002), gains were shown after only four sentences while in Clarke and Garrett (2004) it took only a single minute of sentence training for listeners to reach accuracy and reaction time levels similar to listeners being tested with native speakers. Neither study, however, showed whether perception improvements would extend to novel speakers.

Utilizing a training paradigm similar to that used in the present study, listeners should be tested on a novel speaker at a variety of times throughout training. Testing in this manner would clearly require a greater number of participants because once they have completed a post-test, and are therefore exposed to the novel speaker, listeners would need to be eliminated from training. Staggered testing of this nature may allow researchers to better understand when phonetic categories are being extended to the point that they can be applied to new speakers of a similar foreign accent.

It would also be worthwhile to introduce an accented speaker at post-test whose language is in the same language family as the speakers used in training. While the training in Weil (2001) consisted of a single Marathi speaker, a Russian-accented speaker was introduced at post-test to eliminate the possibility that gains found at post-test were caused only by test familiarity. No substantial gains for the training group over the control group were found for the Russian speaker. The vast differences between Marathi and Russian might predict such a result. When the language used in training is Spanish, however, the introduction of a French or Italian-

accented speaker at post-test may reveal that a single "base" language used in training will transfer to languages with a similar phonetic inventory.

The practical application of the training method described in the current research is fairly straightforward. There are very few circumstances when important messages can be relayed between individuals without relying on complete thoughts to be conveyed. It is rare, therefore, that successful communication can take the form of single-word utterances. It is much more important, then, to improve on sentence level input than with isolated words. The high variability sentence training employed in the current study was shown to be effective at improving a listener's ability to understand foreign-accented speech in this context. At a time when people are more likely than ever before to have daily encounters with individuals of diverse language backgrounds, this type of training may help alleviate some of the confusion that different native languages may cause.

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Appendix A: A complete list of all sentence lists used in the current study.

Sentences #1	**Sentences #2**	**Sentences #3**
1) The deaf grape is a pelt.	1) The cute wag the dead.	1) The Greek pass the trade.
2) The elk smash the price.	2) The great barn is a wrist.	2) A nose is a good scare.
3) The nice hate the elm.	3) The foam heat is life.	3) The sick add the hill.
4) The grave dog is a mop.	4) The soil shook the tent.	4) The owls puff the tug.
5) The corn made the curb.	5) The group howl is stuff.	5) The odds lend black.
6) They tip the jig.	6) Tell the tray to shrug.	6) The thick watch the punt.
7) The bat ought to fill the tap.	7) The vote rid the car.	7) A wink is a true cheat.
8) The thin change the climb.	8) Kick the clip at me.	8) The rear flap is a kid.
9) The patch is for a moth.	9) They sing the news.	9) The high choose love.
10) A few owe the mood.	10) A nod is a bust.	10) They curse the inch pipe.
Sentences #4	**Sentences #5**	**Sentences #6**
1) The best bog is a cob.	1) The bored bolt is a spice.	1) The crews stab stress.
2) The crib rooms the hull.	2) Ask the rod to flip.	2) The droop is cheese.
3) The hitch kept the leg.	3) The dumb guess the night.	3) The cliff closed the rug.
4) The ray eyes the badge.	4) Guess each rope fad.	4) The map had a knee.
5) The wife is a dad.	5) The queen left the slide.	5) The three dub fright.
6) The prime eat the mash.	6) Bid to catch us.	6) The fifth leash is a tire.
7) As deep as a thigh.	7) The food is a chew freak.	7) The kind ink is a rock.
8) Flick the jag.	8) Crack the front rot.	8) The hose part is a drape.
9) They raise the wait.	9) The rest lick the chant.	9) A nap is a book.
10) The flop fee is a fall.	10) The look is a day.	10) Lay the turn next.
11) The pun chart is a gap.		11) The gas is an aid.
Sentences #7	**Sentences #8**	**Sentences #9**
1) The year is a phone club.	1) The ninth dive is golf.	1) The dull goat is a net.
2) The ice clown is a key.	2) The quick pup is a bell.	2) The purse shot the rice.
3) The itch bit the ditch.	3) The hedge boss is time.	3) The low crutch is a beam.
4) The chest lit the gate.	4) The wide flame is a mitt.	4) Most doubt the arm.
5) The odd flag is a root.	5) The cheap elf may wreck.	5) The code clash is fine.
6) Give the crowd a hoof.	6) The hole dove less.	6) The hog dip is a risk.
7) The smart beef is ten.	7) The kiss wed the fact.	7) A loss is a mouth cry.
8) The rude sip the nuts.	8) The shade is so blind.	8) The wood jab is shop.
9) Carve the mass nerve.	9) A cost is a weave.	9) Feel the reef sap.
10) The birth is a boost.	10) The edge is its own sir.	10) Have a pond arc.

Sentences #10	**Sentences #11**	**Sentences #12**
1) The ripe priest is a laugh. 2) The cave and ball are shut. 3) The jaw fed the tile. 4) The knife wove the bluff 5) The wage set the lash. 6) The sky reek is out. 7) The chair hug is a flood. 8) The loose dime is done. 9) They hear the depth.	1) The ox paid the pearl. 2) The weird ship is a dart. 3) Apt feet fell big. 4) All gum is wine. 5) You sell the mist 6) The falls weep if last. 7) The fresh buck fit the brace. 8) The past tube is a case. 9) The form bet the crush.	1) The ears bash the earth. 2) The force hurt the hat. 3) The pink maze is a cow. 4) Those ail the page. 5) The void is a champ. 6) The tree put the goose back. 7) Scrub the chance line. 8) Rip the bug plus Bob. 9) The youth flight is a rush. 10) The wake is a lap.
Sentences #13	**Sentences #14**	**Sentences #15**
1) The ford hid the pants. 2) The pan was a toe. 3) The plush cane the wheat. 4) The deed box the smile. 5) You rub the fraud. 6) The feast is death. 7) Then we pile the crash. 8) The dish is the bar. 9) A heap is not a ride. 10) The end is the rat. 11) A fuss is there. 12) They are the pest.	1) The five dab the bean. 2) The mute cloud is awe. 3) The pick start the nut. 4) The moose tan the frog. 5) The pit is the trash. 6) A job is a log. 7) Our need is to nab them. 8) A peck is a blush bud. 9) The wish is fate. 10) Snuff the rap or else. 11) The hire is bait.	1) Who sped the turf? 2) The cape is the nest. 3) The cast crave the law. 4) The fame rate the shout. 5) Please neck the path. 6) Why jam the air? 7) The oak leave the toil. 8) The crime is the sit. 9) The bead ache the dig. 10) The deck is far. 11) A drop will take the size.
Sentences #16	**Sentences #17**	**Sentences #18**
1) Peck the bath or the bee 2) The hot frown is a kite. 3) The shin is new. 4) The oils pinch the court. 5) The pod race the shed. 6) The bus will float the fin. 7) The raw rack is neat. 8) Starve the test beast. 9) Heed the bush rut. 10) The eel dodge the rave.	1) The rash comes by wire. 2) They fling the mud range. 3) The rich cook the south. 4) Sniff off the jug. 5) The fort grade a fake act. 6) I am cut but sag. 7) The quiz shaft the roar. 8) The chop is a gun aim. 9) The nine whiff the raid.	1) The dot is a lime chill. 2) The cat aims the dice. 3) The claws freeze the axe. 4) The fat art is a rose. 5) The camp grew a lip. 6) The note got his crab. 7) The gray hush is a chip. 8) The loud rob the fade. 9) Bless the claw fool. 10) They hide the cub.

Sentences #19	**Sentences #20**	
1) Find the paste!	1) A fast sigh is a joke.	
2) The notch is a rule.	2) The brass seed is a duke.	
3) The wheel can't bark.	3) Pack the beard in cork.	
4) The white cup is a god.	4) The wise robe is an ace.	
5) The shy cage is dough.	5) An eye is a fair cart.	
6) The throat sat on the perch.	6) The lid flash is a click.	
7) The hut led the hike.	7) Wash the web slice.	
8) The drug slid up the cab.	8) Did the crate walk?	
9) A raft is a thief.	9) Get the base a ramp.	
10) The ebb is an age.	10) The tilt is a pad.	
11) A chat is a buzz.		

Appendix B: A complete list of all adapted word lists used in the current study.

Word List #1	**Word List #2**	**Word List #3**	**Word List #4**
1) tip	1) at	1) wink	1) as
2) thin	2) barn	2) watch	2) badge
3) tap	3) bust	3) tug	3) best
4) smash	4) car	4) true	4) bog
5) price	5) clip	5) trade	5) chart
6) patch	6) cute	6) thick	6) cob
7) owe	7) dash	7) sick	7) crib
8) ought	8) dead	8) scare	8) dad
9) nice	9) foam	9) rear	9) deep
10) moth	10) great	10) punt	10) eat
11) mop	11) group	11) puff	11) eyes
12) mood	12) heat	12) pipe	12) fall
13) made	13) howl	13) pass	13) fee
14) jig	14) kick	14) owls	14) flick
15) hate	15) life	15) odds	15) flop
16) grave	16) me	16) nose	16) gap
17) grape	17) news	17) love	17) hitch
18) for	18) nod	18) lend	18) hull
19) pelt	19) rid	19) kid	19) jag
20) fill	20) shook	20) inch	20) kept
21) few	21) shrug	21) hill	21) leg
22) elm	22) sing	22) high	22) mash
23) elk	23) soil	23) Greek	23) prime
24) dog	24) stuff	24) good	24) pun
25) deaf	25) tell	25) flap	25) raise
26) curb	26) tent	26) curse	26) ray
27) corn	27) tray	27) choose	27) rooms
28) climb	28) vote	28) cheat	28) thigh
29) change	29) wag	29) black	29) wait
30) bat	30) wrist	30) add	30) wife

Word List #5	**Word List #6**	**Word List #7**	**Word List #8**
1) ask	1) aid	1) year	1) wreck
2) bid	2) book	2) ten	2) wide
3) bolt	3) cheese	3) smart	3) wed
4) bored	4) cliff	4) sip	4) weave
5) catch	5) closed	5) rude	5) time
6) chant	6) crews	6) root	6) so
7) chew	7) drape	7) phone	7) sir
8) crack	8) droop	8) odd	8) shade
9) day	9) dub	9) nuts	9) quick
10) dumb	10) fifth	10) nerve	10) pup
11) each	11) fright	11) mass	11) own
12) fad	12) gas	12) lit	12) ninth
13) flip	13) had	13) key	13) mitt
14) food	14) hose	14) itch	14) may
15) freak	15) ink	15) ice	15) less
16) front	16) kind	16) hoof	16) kiss
17) guess	17) knee	17) give	17) hole
18) left	18) lay	18) gate	18) hedge
19) lick	19) leash	19) flag	19) golf
20) look	20) map	20) ditch	20) flame
21) night	21) nap	21) crowd	21) fact
22) pint	22) next	22) club	22) elf
23) queen	23) part	23) clown	23) edge
24) rest	24) rock	24) chest	24) dove
25) rod	25) rug	25) chess	25) dive
26) rope	26) stab	26) carve	26) cost
27) rot	27) stress	27) boost	27) cheap
28) slide	28) three	28) bit	28) boss
29) spice	29) tire	29) birth	29) blind
30) us	30) turn	30) beef	30) bell

Word List #9	**Word List #10**	**Word List #11**	**Word List #12**
1) wood	1) and	1) all	1) ail
2) shot	2) ball	2) apt	2) back
3) shop	3) bluff	3) beg	3) bash
4) sap	4) cave	4) big	4) bob
5) risk	5) chair	5) brace	5) bug
6) rice	6) clutch	6) buck	6) champ
7) reef	7) depth	7) case	7) chance
8) purse	8) dime	8) crush	8) cow
9) pond	9) done	9) dart	9) ears
10) net	10) fed	10) dine	10) earth
11) mouth	11) flood	11) falls	11) flight
12) most	12) foot	12) feet	12) force
13) low	13) hear	13) fell	13) goose
14) loss	14) hug	14) fit	14) hat
15) jab	15) jaw	15) form	15) hurt
16) hog	16) knife	16) gum	16) lap
17) have	17) lash	17) if	17) line
18) goat	18) laugh	18) last	18) maze
19) fine	19) loose	19) mist	19) page
20) feel	20) out	20) ox	20) pink
21) dull	21) park	21) paid	21) plus
22) doubt	22) priest	22) past	22) put
23) dip	23) reek	23) pearl	23) rip
24) cry	24) ripe	24) sell	24) rush
25) crutch	25) set	25) ship	25) scrub
26) code	26) shut	26) tube	26) those
27) clash	27) sky	27) weep	27) tree
28) beam	28) tile	28) weird	28) void
29) arm	29) wage	29) wine	29) wake
30) arc	30) wove	30) you	30) youth

Word List #13	**Word List #14**	**Word List #15**	**Word List #16**
1) are	1) awe	1) why	1) bath
2) bar	2) bait	2) who	2) beast
3) box	3) bean	3) turf	3) bee
4) cane	4) blush	4) toil	4) bus
5) crash	5) bud	5) take	5) bush
6) death	6) cloud	6) sped	6) court
7) deed	7) dab	7) size	7) dodge
8) dish	8) else	8) sit	8) eel
9) end	9) fate	9) shout	9) fin
10) feast	10) five	10) rate	10) float
11) ford	11) frog	11) please	11) frown
12) fraud	12) hire	12) path	12) heed
13) fuss	13) job	13) oak	13) hot
14) heap	14) log	14) nest	14) kite
15) hid	15) moose	15) neck	15) neat
16) is	16) mute	16) leave	16) new
17) not	17) nab	17) law	17) oils
18) pan	18) need	18) jam	18) or
19) pants	19) nut	19) far	19) peck
20) pest	20) our	20) fame	20) pinch
21) pile	21) perk	21) drop	21) pod
22) plush	22) pick	22) dig	22) race
23) rat	23) pit	23) deck	23) rack
24) ride	24) rap	24) crime	24) rave
25) rub	25) snuff	25) crave	25) raw
26) smile	26) start	26) cast	26) rut
27) then	27) tan	27) cape	27) shed
28) there	28) them	28) bead	28) sour
29) toe	29) trash	29) air	29) starve
30) wheat	30) wish	30) ache	30) test

Word List #17	**Word List #18**	**Word List #19**	**Word List #20**
1) wire	1) rose	1) age	1) wise
2) whiff	2) rob	2) bark	2) web
3) south	3) note	3) buzz	3) wash
4) sniff	4) loud	4) cab	4) walk
5) shaft	5) lip	5) cage	5) tilt
6) sag	6) lime	6) can't	6) slice
7) roar	7) hush	7) chat	7) sigh
8) rich	8) his	8) cup	8) seed
9) rash	9) hide	9) dough	9) robe
10) range	10) grew	10) drug	10) ramp
11) raid	11) gray	11) ebb	11) pad
12) quiz	12) got	12) wheel	12) pack
13) off	13) freeze	13) find	13) lid
14) nine	14) fool	14) god	14) joke
15) mud	15) fat	15) hike	15) in
16) jug	16) fade	16) hut	16) get
17) gun	17) dot	17) led	17) flash
18) grade	18) dice	18) notch	18) fast
19) fort	19) cub	19) on	19) fair
20) fling	20) crab	20) paste	20) eye
21) fake	21) claws	21) perch	21) duke
22) cut	22) claw	22) raft	22) did
23) cook	23) chip	23) rule	23) crate
24) comes	24) chill	24) sat	24) cork
25) chop	25) cat	25) shy	25) click
26) by	26) camp	26) slid	26) cart
27) but	27) bless	27) white	27) brass
28) am	28) axe	28) thief	28) beard
29) aim	29) art	29) throat	29) base
30) act	30) aims	30) up	30) ace

Appendix C: The following are all twenty word lists separated into phonetic segments. The first 50 words in each list are from Egan (1948). The following 30 words are those used in the present experiment. The existence of a phoneme in a word is represented with a "1". In the row labeled "Target" are those percentages reported by Egan (1948) for the breakdown of each word list. In the row labeled "Actual" are the percentages of each individual list used in the current study. The row labeled "change needed" lists how many of each individual phonetic class are needed to match the current list to Egan (1948).

The columns for each list are identical and are as follows:

A: Initial long vowel
B: Medial long vowel
C: Final long vowel
D: Initial short vowel
E: Medial short vowel
F: Final short vowel
G: Medial diphthong
H: Initial transitional (nasal)
I: Initial semivowel
J: Initial fricative
K: Initial voiced stop
L: Initial voiceless stop
M: Final transitional (nasal)
N: Final semivowel
O: Final fricative
P: Final voiced stop
Q: Final voiceless stop

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
are	1													1			
bad					1						1					1	
bar		1									1			1			
bask					1						1				1		
box					1						1						1
cane		1										1	1				
cleanse					1							1	1				
clove		1										1			1		
crash					1							1			1		
creed		1										1				1	
death					1						1				1		
deed		1									1					1	
dike							1				1						1
dish					1						1				1		
end				1									1				
feast		1								1					1		
fern					1					1				1			
folk		1								1				1			
ford		1								1				1			
fraud		1								1						1	
fuss					1					1					1		
grove		1									1				1		
heap		1								1							1
hid					1					1						1	
hive							1			1					1		
hunt					1					1			1				
is				1											1		
mange		1						1					1				
no			1					1									
nook		1						1									1
not					1			1									1
pan					1							1	1				
pants					1							1	1				
pest					1							1			1		
pile							1					1		1			
plush					1							1			1		
rag					1				1							1	
rat					1				1								1
ride							1		1							1	
rise							1		1						1		
rub					1				1							1	
slip					1					1							1
smile							1			1				1			
strife							1			1					1		
such					1					1					1		
then					1					1			1				
there					1					1				1			
toe			1									1					
use		1							1						1		
wheat		1							1								1
count	1	15	2	2	23	0	7	4	7	16	9	11	8	8	16	8	8
are	1													1			
bar		1									1			1			
box					1						1						1
cane		1										1	1				
crash					1							1			1		
death					1						1				1		
deed		1									1					1	
dish					1						1				1		
end				1									1				
feast		1								1					1		
ford		1								1				1			
fraud		1								1						1	
fuss					1					1					1		
heap		1								1							1
hid					1					1						1	
is				1											1		
not					1			1									1
pan					1							1	1				
pants					1							1	1				
pest					1							1			1		
pile							1					1		1			
plush					1							1			1		
rat					1				1								1
ride							1		1							1	
rub					1				1							1	
smile							1			1				1			
then					1					1			1				
there					1					1				1			
toe			1									1					
wheat		1							1								1
	1	8	1	2	15	0	3	1	4	9	5	8	5	6	8	5	5
Actual	3.3%	26.7%	3.3%	6.7%	50.0%	0.0%	10.0%	3.7%	14.8%	33.3%	18.5%	29.6%	17.2%	20.7%	27.6%	17.2%	17.2%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	0	2	0	-1	-3	1	1	2	1	-2	0	-2	-2	0	0	1	2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
awe	1													1			
bait		1									1						1
bean		1									1		1				
blush					1						1				1		
bought		1									1						1
bounce							1				1		1				
bud					1						1					1	
charge		1								1				1			
cloud							1					1				1	
corpse		1										1		1			
dab					1						1					1	
earl	1													1			
else				1										1			
fate		1								1							1
five							1			1					1		
frog		1								1						1	
gill					1						1			1			
gloss		1									1				1		
hire							1			1				1			
hit					1					1							1
hock		1								1							1
job		1								1						1	
log		1							1							1	
moose		1						1							1		
mute							1	1									1
nab					1			1								1	
need		1						1								1	
niece		1						1							1		
nut					1			1									1
our	1													1			
perk		1										1					1
pick					1							1					1
pit					1							1					1
quart		1										1					1
rap					1				1								1
rib					1				1							1	
scythe					1					1					1		
shoe			1							1							
sludge					1					1						1	
snuff					1					1					1		
start		1								1				1			
suck					1					1							1
tan					1							1	1				
tang		1										1	1				
them					1					1			1				
trash					1					1					1		
vamp					1					1							1
vast					1					1					1		
ways		1							1						1		
wish					1				1						1		
count	3	19	1	1	21	0	5	6	5	18	9	8	5	9	11	10	14
awe	1													1			
bait		1									1						1
bean		1									1		1				
blush					1						1				1		
bud					1						1					1	
cloud							1					1				1	
dab					1						1					1	
else				1										1			
fate		1								1							1
five							1			1					1		
frog		1								1						1	
hire							1			1				1			
job		1								1						1	
log		1							1							1	
moose		1						1							1		
mute							1	1									1
nab					1			1								1	
need		1						1								1	
nut					1			1									1
our	1													1			
perk		1										1					1
pick					1							1					1
pit					1							1					1
rap					1				1								1
snuff					1					1					1		
start		1								1				1			
tan					1							1	1				
them					1					1			1				
trash					1					1					1		
wish					1				1						1		
	2	10	0	1	13	0	4	5	3	9	5	5	3	5	6	8	8
Actual	6.7%	33.3%	0.0%	3.3%	43.3%	0.0%	13.3%	18.5%	11.1%	33.3%	18.5%	18.5%	10.0%	16.7%	20.0%	26.7%	26.7%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	0	1	0	-1	1	0	-2	3	-2	0	2	0	1	2	-2	-1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
ache	1																1
air	1													1			
bald		1									1					1	
barb		1									1					1	
bead		1									1					1	
cape		1										1					1
cast					1							1			1		
check					1					1							1
class					1							1			1		
crave		1										1			1		
crime							1					1	1				
deck					1						1						1
dig					1						1					1	
dill					1						1			1			
drop					1						1					1	
fame		1								1			1				
far					1					1				1			
fig					1					1						1	
flush					1					1					1		
gnaw			1					1									
hurl		1								1				1			
jam					1					1			1				
law			1						1								
leave		1							1						1		
lush					1				1						1		
muck					1			1									1
neck					1			1									1
nest					1			1							1		
oak	1																1
path					1							1			1		
please		1										1			1		
pulse					1							1		1			
rate		1							1								1
rouse							1		1						1		
shout							1			1							1
sit					1					1							1
size							1			1					1		
sob		1								1						1	
sped					1					1						1	
stag					1					1						1	
take		1										1					1
thrash					1					1					1		
toil							1					1		1			
trip					1							1					1
turf		1										1		1			
vow			1							1							
wedge					1				1							1	
wharf		1							1					1			
who			1							1							
why			1						1								
count	3	14	5	0	23	0	5	4	8	16	7	12	3	8	12	10	12
ache	1																1
air	1													1			
bead		1									1					1	
cape		1										1					1
cast					1							1			1		
crave		1										1			1		
crime							1					1	1				
deck					1						1						1
dig					1						1					1	
drop					1						1					1	
fame		1								1			1				
far					1					1				1			
jam					1					1			1				
law			1						1								
leave		1							1						1		
neck					1			1									1
nest					1			1							1		
oak	1																1
path					1							1			1		
please		1										1			1		
rate		1							1								1
shout							1			1							1
sit					1					1							1
size							1			1					1		
sped					1					1						1	
take		1										1					1
toil							1					1		1			
turf		1										1		1			
who			1							1							
why			1						1								
	3	9	3	0	11	0	4	2	4	8	4	9	3	4	7	4	9
Actual	10.0%	30.0%	10.0%	0.0%	36.7%	0.0%	13.3%	7.4%	14.8%	29.6%	14.8%	33.3%	11.1%	14.8%	25.9%	14.8%	33.3%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-2	1	-2	1	1	1	0	1	1	-1	1	-3	0	1	0	1	-3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sho	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
bath					1						1				1		
beast		1									1				1		
bee			1								1						
blonde					1						1		1				
budge					1						1				1		
bus					1						1				1		
bush					1						1				1		
cloak		1										1					1
course		1										1		1			
court		1										1		1			
dodge					1						1				1		
dupe		1									1						1
earn	1													1			
eel	1													1			
fin					1					1			1				
float		1								1							1
frown							1			1			1				
hatch					1					1					1		
heed		1								1						1	
hiss					1					1					1		
hot					1					1							1
how			1							1							
kite							1					1					1
merge		1						1						1			
move		1						1							1		
neat		1						1									1
new			1					1									
oils	1													1			
or	1													1			
peck					1							1					1
pert		1										1		1			
pinch					1							1	1				
pod					1							1				1	
race		1							1						1		
rack					1				1								1
rave		1							1						1		
raw			1						1								
rut					1				1								1
sage		1								1					1		
scab					1					1						1	
shed					1					1						1	
shin					1					1			1				
sketch					1					1					1		
slap					1					1							1
sour							1			1				1			
starve		1								1				1			
strap					1					1							1
test					1							1			1		
tick					1							1					1
touch					1							1			1		
count	4	15	4	0	24	0	3	4	5	17	9	11	5	10	15	4	12
bath					1						1				1		
beast		1									1				1		
bee			1								1						
bus					1						1				1		
bush					1						1				1		
court		1										1		1			
dodge					1						1				1		
eel	1													1			
fin					1					1			1				
float		1								1							1
frown							1			1			1				
heed		1								1						1	
hot					1					1							1
kite							1					1					1
neat		1						1									1
new			1					1									
oils	1													1			
or	1													1			
peck					1							1					1
pinch					1							1	1				
pod					1							1				1	
race		1							1						1		
rack					1				1								1
rave		1							1						1		
raw			1						1								
rut					1				1								1
shed					1					1						1	
shin					1					1			1				
starve		1								1				1			
test					1							1			1		
	3	8	3	0	14	0	2	2	5	8	6	6	4	5	8	3	7
Actual	10.0%	26.7%	10.0%	0.0%	46.7%	0.0%	6.7%	7.4%	18.5%	29.6%	22.2%	22.2%	14.8%	18.5%	29.6%	11.1%	25.9%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-2	2	-2	1	-2	1	2	1	0	-1	-1	1	-1	0	-1	3	-1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
add				1												1	
bathe		1									1				1		
beck					1						1						1
black					1						1						1
bronze					1						1		1				
browse							1				1				1		
cheat		1								1							1
choose		1								1					1		
curse		1								1				1			
feed		1								1						1	
flap					1					1							1
gape		1									1						1
good		1									1					1	
greek		1									1						1
grudge					1						1				1		
high			1							1							
hill					1					1				1			
inch				1									1				
kid					1							1				1	
lend					1				1				1				
love					1				1						1		
mast					1			1							1		
nose		1						1							1		
odds				1												1	
owls	1																
pass					1							1			1		
pipe							1					1					1
puff					1							1			1		
punt					1							1	1				
rear		1							1					1			
rind							1		1				1				
rode		1							1							1	
roe			1						1								
scare		1												1			
shine							1			1			1				
shove					1					1					1		
sick					1					1							1
sly	1									1							
solve		1								1				1			
thick					1					1							1
thud					1					1						1	
trade		1										1				1	
true			1									1					
tug					1							1				1	
vase		1								1					1		
watch		1							1						1		
wink		1							1				1				
wrath					1				1						1		
yawn		1							1				1				
zone		1								1			1				
count	2	19	3	3	19	0	4	2	10	16	9	8	9	5	13	9	9
add				1												1	
black					1						1						1
cheat		1								1							1
choose		1								1					1		
curse		1								1				1			
flap					1					1							1
good		1									1					1	
greek		1									1						1
high			1							1							
hill					1					1				1			
inch				1									1				
kid					1							1				1	
lend					1				1				1				
love					1				1						1		
nose		1						1							1		
odds				1												1	
owls	1																
pass					1							1			1		
pipe							1					1					1
puff					1							1			1		
punt					1							1	1				
rear		1							1					1			
scare		1												1			
sick					1					1							1
thick					1					1							1
trade		1										1				1	
true			1									1					
tug					1							1				1	
watch		1							1						1		
wink		1							1				1				
	1	11	2	3	12	0	1	1	5	8	3	8	4	4	6	6	7
Actual	3.3%	36.7%	6.7%	10.0%	40.0%	0.0%	3.3%	3.8%	19.2%	30.8%	11.5%	30.8%	14.3%	14.3%	21.4%	21.4%	25.0%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	0	-1	-1	-2	0	1	3	2	0	-1	2	-2	-1	2	1	-1	0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
as				1											1		
badge					1						1				1		
best					1						1				1		
bog		1									1					1	
chart		1								1				1			
cloth		1										1			1		
clothes		1										1			1		
cob					1							1				1	
crib					1							1				1	
dad					1						1					1	
deep		1									1						1
eat	1																1
eyes	1														1		
fall		1								1				1			
fee			1							1							
flick					1					1							1
flop					1					1							1
forge		1								1				1			
fowl							1			1				1			
gage		1									1				1		
gap					1						1						1
grope		1									1						1
hitch				1						1					1		
hull		1								1				1			
jag					1					1						1	
kept					1							1					1
leg					1				1							1	
mash					1			1							1		
nigh			1					1									
ode	1															1	
prig					1							1				1	
prime							1					1	1				
pun					1							1	1				
pus					1							1			1		
raise		1							1						1		
ray			1						1								
reap		1							1								1
rooms		1							1				1				
rough					1				1						1		
scan					1					1			1				
shank		1								1			1				
slouch							1			1					1		
sup					1					1							1
thigh			1							1							
thus					1					1					1		
tongue					1							1	1				
wait		1							1								1
wasp					1				1						1		
wife							1		1						1		
writ					1				1								1
count	3	15	4	2	22	0	4	2	10	16	8	10	6	5	16	8	11
as				1											1		
badge					1						1				1		
best					1						1				1		
bog		1									1					1	
chart		1								1				1			
cob					1							1				1	
crib					1							1				1	
dad					1						1					1	
deep		1									1						1
eat	1																1
eyes	1														1		
fall		1								1				1			
fee			1							1							
flick					1					1							1
flop					1					1							1
gap					1						1						1
hitch				1						1					1		
hull		1								1				1			
jag					1					1						1	
kept					1							1					1
leg					1				1							1	
mash					1			1							1		
prime							1					1	1				
pun					1							1	1				
raise		1							1						1		
ray			1						1								
rooms		1							1				1				
thigh			1							1							
wait		1							1								1
wife							1		1						1		
	2	8	3	2	13	0	2	1	6	9	6	5	3	3	8	6	7
Actual	6.7%	26.7%	10.0%	6.7%	43.3%	0.0%	6.7%	3.8%	23.1%	34.6%	23.1%	19.2%	11.1%	11.1%	29.6%	22.2%	25.9%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	2	-2	-1	-1	1	2	2	-1	-3	-1	1	0	3	-1	-1	-1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
act				1													1
aim	1												1				
am				1									1				
but					1						1						1
by			1								1						
chop					1					1							1
coast		1										1			1		
comes					1							1	1				
cook		1										1					1
cut					1							1					1
dope		1									1						1
dose		1									1				1		
dwarf		1									1			1			
fake		1								1							1
fling		1								1			1				
fort		1								1				1			
gasp					1						1				1		
grade		1									1					1	
gun					1						1		1				
him					1					1			1				
jug					1					1						1	
knit					1			1									1
mote		1						1									1
mud					1			1								1	
nine							1	1					1				
off	1														1		
pent					1							1	1				
phase		1								1					1		
pig					1							1				1	
plod					1							1				1	
pounce							1					1	1				
quiz		1										1			1		
raid		1							1							1	
range		1							1				1				
rash					1				1						1		
rich					1				1						1		
roar		1							1					1			
sag					1					1						1	
scout							1			1							1
shaft					1					1					1		
siege		1								1					1		
sin					1					1			1				
sledge					1					1					1		
sniff					1					1					1		
south							1			1					1		
though			1							1							
whiff					1				1						1		
wire							1		1					1			
woe			1						1								
woo			1						1								
count	2	16	4	2	21	0	5	4	9	16	8	9	11	4	14	7	10
act				1													1
aim	1												1				
am				1									1				
but					1						1						1
by			1								1						
chop					1					1							1
comes					1							1	1				
cook		1										1					1
cut					1							1					1
fake		1								1							1
fling		1								1			1				
fort		1								1				1			
grade		1									1					1	
gun					1						1		1				
jug					1					1						1	
mud					1			1								1	
nine							1	1					1				
off	1														1		
quiz		1										1			1		
raid		1							1							1	
range		1							1				1				
rash					1				1						1		
rich					1				1						1		
roar		1							1					1			
sag					1					1						1	
shaft					1					1					1		
sniff					1		1			1					1		
south							1		1					1			
whiff					1				1						1		
wire										1					1		
	2	9	1	2	13	0	3	2	7	9	4	4	7	3	8	5	6
Actual	6.7%	30.0%	3.3%	6.7%	43.3%	0.0%	10.0%	7.7%	26.9%	34.6%	15.4%	15.4%	24.1%	10.3%	27.6%	17.2%	20.7%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	1	0	-1	-1	1	1	1	-2	-3	1	3	-4	3	0	1	1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sho	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
ask				1											1		
bid					1						1					1	
bind							1				1		1				
bolt		1									1			1			
bored		1									1			1			
calf					1							1			1		
catch					1							1			1		
chant					1					1			1				
chew			1							1							
clod		1										1				1	
cod												1				1	
crack					1							1					1
day			1								1						
deuce		1									1				1		
dumb					1						1		1				
each	1														1		
ease	1														1		
fad					1					1						1	
flip					1					1							1
food		1								1						1	
forth		1								1				1			
freak		1								1							1
frock		1								1							1
front					1					1			1				
guess					1						1				1		
hum					1					1			1				
jell					1					1				1			
kill					1							1		1			
left					1				1						1		
lick					1				1								1
look		1							1								1
night							1	1									1
pint							1					1	1				
queen		1										1	1				
rest					1				1						1		
rhyme							1		1				1				
rod		1							1							1	
roll		1							1					1			
rope		1							1								1
rot					1				1								1
shack					1					1							1
slide							1			1						1	
spice							1			1					1		
this					1					1					1		
thread					1					1						1	
till					1							1		1			
us				1											1		
wheeze		1							1						1		
wig					1				1							1	
yeast		1							1						1		
count	2	15	2	2	22	0	6	1	12	16	8	9	8	7	14	9	10
ask				1											1		
bid					1						1					1	
bolt		1									1			1			
bored		1									1			1			
catch					1							1			1		
chant					1					1			1				
chew			1							1							
crack					1							1					1
day			1								1						
dumb					1						1		1				
each	1														1		
fad					1					1						1	
flip					1					1							1
food		1								1						1	
freak		1								1							1
front					1					1			1				
guess					1						1				1		
left					1				1						1		
lick					1				1								1
look		1							1								1
night							1	1									1
pint							1					1	1				
queen		1										1	1				
rest					1				1						1		
rod		1							1							1	
rope		1							1								1
rot					1				1								1
slide							1			1						1	
spice							1			1					1		
us				1											1		
	1	8	2	2	13	0	4	1	7	9	6	4	5	2	8	5	8
Actual	3.3%	26.7%	6.7%	6.7%	43.3%	0.0%	13.3%	3.7%	25.9%	33.3%	22.2%	14.8%	17.9%	7.1%	28.6%	17.9%	28.6%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	0	2	-1	-1	-1	1	0	2	-2	-2	-1	3	-2	4	-1	1	-1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sho	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
arch	1													1			
beef		1									1				1		
birth		1									1			1			
bit					1						1						1
boost		1									1				1		
carve		1										1		1			
chess					1					1					1		
chest					1					1					1		
clown							1					1	1				
club					1							1				1	
crowd							1					1				1	
cud					1							1				1	
ditch					1						1				1		
flag					1					1						1	
fluff					1					1					1		
foe			1							1							
fume							1			1			1				
fuse							1			1					1		
gate		1									1						1
give					1						1				1		
grace		1									1				1		
hoof		1								1					1		
ice	1														1		
itch				1											1		
key			1									1					
lit					1				1								1
mass					1			1							1		
nerve		1						1						1			
noose		1						1							1		
nuts					1			1									1
odd	1															1	
pact					1							1					1
phone		1								1			1				
reed		1							1							1	
root		1							1								1
rude		1							1							1	
sip					1					1							1
smart		1								1				1			
spud					1					1						1	
ten					1							1	1				
than					1					1			1				
thank		1								1			1				
throne		1								1			1				
toad		1										1				1	
troop		1										1					1
weak		1							1								1
wild							1		1					1			
wipe							1		1								1
with					1				1						1		
year		1							1					1			
count	3	20	2	1	18	0	6	4	9	15	8	10	7	7	15	9	10
beef		1									1				1		
birth		1									1			1			
bit					1						1						1
boost		1									1				1		
carve		1										1		1			
chess					1					1					1		
chest					1					1					1		
clown							1					1	1				
club					1							1				1	
crowd							1					1				1	
ditch					1						1				1		
flag					1					1						1	
gate		1									1						1
give					1						1				1		
hoof		1								1					1		
ice	1														1		
itch				1											1		
key			1									1					
lit					1				1								1
mass					1			1							1		
nerve		1						1						1			
nuts					1			1									1
odd	1															1	
phone		1								1			1				
root		1							1								1
rude		1							1							1	
sip					1					1							1
smart		1								1				1			
ten					1							1	1				
year		1							1					1			
	2	12	1	1	12	0	2	3	4	7	7	6	3	5	10	5	6
Actual	6.7%	40.0%	3.3%	3.3%	40.0%	0.0%	6.7%	11.1%	14.8%	25.9%	25.9%	22.2%	10.3%	17.2%	34.5%	17.2%	20.7%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	-2	0	0	0	1	2	0	1	0	-2	1	0	1	-3	1	1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
ail	1													1			
back					1						1						1
bash					1						1				1		
bob					1						1					1	
bug					1						1					1	
champ					1					1			1				
chance					1					1			1				
clothe		1										1			1		
cord		1										1		1			
cow			1									1					
cue			1									1					
daub		1									1					1	
ears	1													1			
earth	1													1			
etch				1											1		
fir					1					1				1			
flaunt		1								1			1				
flight							1			1							1
force		1								1				1			
goose		1									1				1		
gull		1									1			1			
hat					1					1							1
hurt		1								1				1			
jay			1							1							
lap					1				1								1
line							1		1				1				
maze		1						1							1		
mope		1						1									1
nudge					1			1							1		
page		1										1				1	
pink		1										1	1				
plus					1							1			1		
put		1										1					1
rape		1							1								1
real		1							1					1			
rip					1				1								1
rush					1				1						1		
scrub					1				1							1	
slug					1				1							1	
snipe							1		1								1
staff					1				1						1		
tag					1							1				1	
those		1								1					1		
thug					1					1						1	
tree			1									1					
valve					1					1				1			
void							1			1						1	
wade		1							1							1	
wake		1							1								1
youth		1							1						1		
count	3	19	4	1	19	0	4	3	13	13	7	10	5	10	11	10	10
ail	1													1			
back					1						1						1
bash					1						1				1		
bob					1						1					1	
bug					1						1					1	
champ					1					1			1				
chance					1					1			1				
cow			1									1					
ears	1													1			
earth	1													1			
flight							1			1							1
force		1								1				1			
goose		1									1				1		
hat					1					1							1
hurt		1								1				1			
lap					1				1								1
line							1		1				1				
maze		1						1							1		
page		1										1				1	
pink		1										1	1				
plus					1							1			1		
put		1										1					1
rip					1				1								1
rush					1				1						1		
scrub					1				1							1	
those		1								1					1		
tree			1									1					
void							1			1						1	
wake		1							1								1
youth		1							1						1		
	3	10	2	0	12	0	3	1	7	8	5	6	4	5	7	5	7
Actual	10.0%	33.3%	6.7%	0.0%	40.0%	0.0%	10.0%	3.7%	25.9%	29.6%	18.5%	22.2%	14.3%	17.9%	25.0%	17.9%	25.0%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-2	0	-1	1	0	1	1	2	-2	-1	0	1	-1	1	0	1	0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
arc	1													1			
arm	1													1			
beam		1									1					1	
bliss					1						1				1		
chunk					1					1			1				
clash					1							1			1		
code		1										1				1	
crutch					1							1			1		
cry			1									1					
dip					1						1						1
doubt							1				1						1
drake		1									1						1
dull					1						1			1			
feel		1								1				1			
fine							1			1			1				
frisk					1					1					1		
fudge					1					1					1		
goat		1									1						1
have					1					1					1		
hog		1								1						1	
jab					1					1						1	
jaunt		1								1			1				
kit					1							1					1
lag					1				1							1	
latch					1				1						1		
loss		1							1						1		
low			1						1								
most		1						1							1		
mouth							1	1							1		
net					1			1									1
pond					1							1	1				
probe		1										1				1	
prod					1							1				1	
punk					1							1	1				
purse		1										1		1			
reef		1							1						1		
rice							1		1						1		
risk					1				1						1		1
sap					1					1							1
shop					1					1							1
shot					1					1							
sign							1			1			1				
snow			1							1							
sprig					1					1						1	
spy			1							1							
stiff					1					1					1		
tab					1							1				1	
urge	1													1			
wave		1							1						1		
wood		1							1							1	
count	3	14	4	0	24	0	5	3	9	17	7	11	6	6	15	10	9
arc	1													1			
arm	1													1			
beam		1									1					1	
clash					1							1			1		
code		1										1				1	
crutch					1							1			1		
cry			1									1					
dip					1						1						1
doubt							1				1						1
dull					1						1			1			
feel		1								1				1			
fine							1			1			1				
goat		1									1						1
have					1					1					1		
hog		1								1						1	
jab					1					1						1	
loss		1							1						1		
low			1						1								
most		1						1							1		
mouth							1	1							1		
net					1			1									1
pond					1							1	1				
purse		1										1		1			
reef		1							1						1		
rice							1		1						1		
risk					1				1						1		1
sap					1					1							1
shop					1					1							1
shot					1					1							
wood		1							1							1	
	2	10	2	0	12	0	4	3	6	8	5	6	2	5	9	5	7
Actual	6.7%	33.3%	6.7%	0.0%	40.0%	0.0%	13.3%	10.7%	21.4%	28.6%	17.9%	21.4%	7.1%	17.9%	32.1%	17.9%	25.0%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	0	-1	1	0	1	0	0	-1	-1	1	1	1	1	-2	1	0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
and				1									1				
ass				1											1		
ball		1									1			1			
bluff					1						1				1		
cad					1							1				1	
cave		1										1			1		
chafe		1								1					1		
chair		1								1				1			
chap					1					1							1
chink		1								1			1				
cling		1										1	1				
clutch					1							1			1		
depth					1						1						1
dime							1				1		1				
done					1						1		1				
fed					1					1						1	
flog		1								1						1	
flood					1					1						1	
foot		1								1							1
fought		1								1							1
frill					1					1				1			
gnash					1			1							1		
greet		1									1						1
hear		1								1				1			
hug					1					1						1	
hunch					1					1			1				
jaw			1							1							
jazz					1					1					1		
jolt		1								1				1			
knife							1	1							1		
lash					1				1						1		
laugh					1				1						1		
ledge					1				1						1		
loose		1							1						1		
out	1																1
park		1										1		1			
priest		1										1			1		
reek		1							1								1
ripe							1		1								1
romp		1							1				1				
rove		1							1						1		
set					1					1							1
shut					1					1							1
sky			1							1							
sod		1								1						1	
throb		1								1						1	
tile							1					1		1			
vine							1			1			1				
wage		1							1						1		
wove		1							1						1		
count	1	22	2	2	18	0	5	2	10	22	6	7	8	7	16	7	10
and				1									1				
ball		1									1			1			
bluff					1						1				1		
cave		1										1			1		
chair		1								1				1			
clutch					1							1			1		
depth					1						1						1
dime							1				1		1				
done					1						1		1				
fed					1					1						1	
flood					1					1						1	
foot		1								1							1
hear		1								1				1			
hug					1					1						1	
jaw			1							1							
knife							1	1							1		
lash					1				1						1		
laugh					1				1						1		
loose		1							1						1		
out	1																1
park		1										1		1			
priest		1										1			1		
reek		1							1								1
ripe							1		1								1
set					1					1							1
shut					1					1							1
sky			1							1							
tile							1					1		1			
wage		1							1						1		
wove		1							1						1		
	1	11	2	1	11	0	4	1	7	10	5	5	3	5	10	3	7
Actual	3.3%	36.7%	6.7%	3.3%	36.7%	0.0%	13.3%	3.6%	25.0%	35.7%	17.9%	17.9%	10.7%	17.9%	35.7%	10.7%	25.0%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	0	-1	-1	0	1	1	0	2	-2	-3	1	2	0	1	-3	3	0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
bat					1						1						1
beau			1								1						
change		1								1			1				
climb							1					1	1				
corn		1										1		1			
curb		1										1		1			
deaf					1						1				1		
dog		1									1					1	
elk				1										1			
elm				1										1			
few		1								1							
fill					1					1				1			
fold		1								1				1			
for		1								1				1			
gem					1					1			1				
grape		1									1						1
grave		1									1				1		
hack					1					1							1
hate		1								1							1
hook					1					1							1
jig					1					1						1	
made		1						1								1	
mood		1						1								1	
mop					1			1									1
moth		1						1							1		
muff					1			1						1			
mush					1			1						1			
my			1					1									
nag					1			1								1	
nice							1	1							1		
nip					1			1									1
ought	1																1
owe	1													1			
patch					1							1			1		
pelt					1							1		1			
plead		1										1				1	
price							1					1			1		
pug					1							1				1	
scuff					1					1					1		
side							1			1						1	
sled					1					1						1	
smash					1					1					1		
smooth		1								1					1		
soap		1								1							1
stead					1					1						1	
taint		1										1	1				
tap					1							1					1
thin					1					1			1				
tip					1							1					1
wean		1							1				1				
count	2	18	2	2	22	0	4	10	1	18	6	11	6	11	9	10	11
bat					1						1						1
change		1								1			1				
climb							1					1	1				
corn		1										1		1			
curb		1										1		1			
deaf					1						1				1		
dog		1									1					1	
elk				1										1			
elm				1										1			
few		1								1							
fill					1					1				1			
pelt					1							1		1			
for		1								1				1			
grape		1									1						1
grave		1									1				1		
hate		1								1							1
jig					1					1						1	
made		1						1								1	
mood		1						1								1	
mop					1			1									1
moth		1						1							1		
nice							1	1							1		
ought	1																1
owe	1													1			
patch					1							1			1		
price							1					1			1		
smash					1					1					1		
tap					1							1					1
thin					1					1			1				
tip					1							1					1
	2	12	0	2	11	0	3	5	0	8	5	8	3	8	7	4	7
Actual	6.7%	40.0%	0.0%	6.7%	36.7%	0.0%	10.0%	19.2%	0.0%	30.8%	19.2%	30.8%	10.0%	26.7%	23.3%	13.3%	23.3%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	-2	1	-1	1	1	1	-3	6	-1	0	-2	0	-2	1	2	0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
at				1													1
barn		1									1			1			
bust					1						1				1		
car		1										1		1			
clip					1							1					1
coax		1										1					1
curve		1										1		1			
cute							1					1					1
darn		1									1			1			
dash					1						1				1		
dead					1						1					1	
douse							1				1				1		
dung					1						1		1				
fife							1			1					1		
foam		1								1			1				
great		1									1						1
group		1									1						1
heat		1								1							1
howl							1			1				1			
hunk					1					1			1				
isle	1													1			
kick					1							1					1
lathe		1							1						1		
life							1		1						1		
me			1					1									
muss					1			1							1		
news		1						1							1		
nick					1			1									1
nod					1			1								1	
oft	1														1		
prude		1										1				1	
purge		1										1		1			
quack							1					1					1
rid					1				1							1	
shook		1								1							1
shrug					1					1						1	
sing		1								1			1				
slab					1					1						1	
smite							1			1							1
soil							1			1				1			
stuff					1					1					1		
tell					1							1		1			
tent					1							1	1				
thy			1							1							
tray			1									1					
vague		1								1						1	
vote		1								1							1
wag					1				1							1	
waif		1							1						1		
wrist					1				1						1		
count	2	18	3	1	18	0	8	5	6	15	9	12	5	9	12	8	13
at				1													1
barn		1									1			1			
bust					1						1				1		
car		1										1		1			
clip					1							1					1
cute							1					1					1
dash					1						1				1		
dead					1						1					1	
foam		1								1			1				
great		1									1						1
group		1									1						1
heat		1								1							1
howl							1			1				1			
kick					1							1					1
life							1		1						1		
me			1					1									
news		1						1							1		
nod					1			1								1	
rid					1				1							1	
shook		1								1							1
shrug					1					1						1	
sing		1								1			1				
soil							1			1				1			
stuff					1					1					1		
tell					1							1		1			
tent					1							1	1				
tray			1									1					
vote		1								1							1
wag					1				1							1	
wrist					1				1						1		
	0	10	2	1	13	0	4	3	4	9	6	7	3	5	6	5	9
Actual	0.0%	33.3%	6.7%	3.3%	43.3%	0.0%	13.3%	10.3%	13.8%	31.0%	20.7%	24.1%	10.7%	17.9%	21.4%	17.9%	32.1%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	1	0	-1	0	-1	1	0	0	2	-1	0	0	0	1	1	1	-2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
bell					1						1			1			
blind							1				1		1				
boss		1									1				1		
cheap		1								1							1
cost		1										1			1		
cuff					1							1			1		
dive							1				1				1		
dove					1						1				1		
edge				1											1		
elf				1										1			
fact					1					1							1
flame		1								1			1				
fleet		1								1							1
gash					1						1				1		
glove					1						1				1		
golf		1									1			1			
hedge										1					1		
hole		1								1				1			
jade		1								1						1	
kiss					1							1			1		
less					1				1						1		
may			1					1									
mesh					1			1							1		
mitt					1			1									1
mode		1						1								1	
morn		1						1						1			
naught		1						1									1
ninth							1	1					1				
oath	1														1		
own	1												1				
pup					1							1					1
quick		1										1					1
scow			1							1							
sense					1					1			1				
shade		1								1						1	
shrub					1					1						1	
sir		1								1				1			
slash					1					1					1		
so			1							1							
tack					1							1					1
teach		1										1			1		
that					1					1							1
time							1					1	1				
tinge					1							1	1				
tweed		1										1				1	
vile							1			1				1			
weave		1							1						1		
wed					1				1							1	
wide							1		1							1	
wreck					1				1								1
count	2	17	3	2	19	0	6	7	5	16	8	10	7	7	16	7	10
bell					1						1			1			
blind							1				1		1				
boss		1									1				1		
cheap		1								1							1
cost		1										1			1		
dive							1				1				1		
dove					1						1				1		
edge				1											1		
elf				1										1			
fact					1					1							1
flame		1								1			1				
golf		1									1			1			
hedge										1					1		
hole		1								1				1			
kiss					1							1			1		
less					1				1						1		
may			1					1									
mitt					1			1									1
ninth							1	1					1				
own	1												1				
pup					1							1					1
quick		1										1					1
shade		1								1						1	
sir		1								1				1			
so			1							1							
time							1					1	1				
weave		1							1						1		
wed					1				1							1	
wide							1		1							1	
wreck					1				1								1
	1	10	2	2	9	0	5	3	5	8	6	5	5	5	9	3	6
Actual	3.3%	33.3%	6.7%	6.7%	30.0%	0.0%	16.7%	11.1%	18.5%	29.6%	22.2%	18.5%	17.9%	17.9%	32.1%	10.7%	21.4%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	0	0	-1	-1	3	1	-1	0	0	-1	-1	2	-2	1	-2	3	1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sho	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
aid	1															1	
barge		1									1			1			
book		1									1						1
cheese		1								1					1		
cliff					1							1			1		
closed		1										1			1		
crews		1										1			1		
dame		1									1		1				
din					1						1		1				
drape		1									1						1
droop		1									1						1
dub					1						1					1	
fifth					1					1					1		
fright							1			1							1
gab					1						1					1	
gas					1						1				1		
had					1					1						1	
hash					1					1					1		
hose		1								1					1		
ink	1												1				
kind							1					1	1				
knee			1					1									
lay			1						1								
leash		1							1						1		
louse							1		1						1		
map					1			1									1
nap					1			1									1
next					1			1									1
part		1										1		1			
pitch					1							1			1		
pump					1							1	1				
rock					1				1								1
rogue		1							1							1	
rug					1				1							1	
rye			1						1								
sang		1								1			1				
sheep		1								1							1
sheik		1								1							1
soar		1								1				1			
stab					1					1						1	
stress					1					1					1		
suit		1								1							1
thou			1							1							
three			1							1							
thresh					1					1					1		
tire							1					1		1			
ton					1							1	1				
tuck					1							1					1
turn		1										1		1			
wield		1							1					1			
count	2	19	5	0	20	0	4	4	8	16	9	11	7	6	13	7	12
aid	1															1	
book		1									1						1
cheese		1								1					1		
cliff					1							1			1		
closed		1										1			1		
crews		1										1			1		
drape		1									1						1
droop		1									1						1
dub					1						1					1	
fifth					1					1					1		
fright							1			1							1
gas					1						1				1		
had					1					1						1	
hose		1								1					1		
ink	1												1				
kind							1					1	1				
knee			1					1									
lay			1						1								
leash		1							1						1		
map												1		1			
nap							1					1		1			
next												1		1			
part		1			1			1									1
rock					1				1								1
rug					1				1							1	
stab																	
stress					1					1					1		
three			1							1							
tire					1			1									1
turn		1			1			1									1
	2	10	3	0	11	0	3	4	4	7	5	7	2	3	9	4	8
Actual	6.7%	33.3%	10.0%	0.0%	36.7%	0.0%	10.0%	14.3%	14.3%	25.0%	17.9%	25.0%	7.4%	11.1%	33.3%	14.8%	29.6%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	0	-2	1	1	1	1	-1	2	0	1	0	1	3	-2	1	-2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sho	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
all	1													1			
apt				1													1
bet					1						1						1
big					1						1					1	
booth		1									1				1		
brace		1									1				1		
braid		1									1					1	
buck					1						1						1
case		1										1			1		
clew					1							1		1			
crush					1							1			1		
dart		1									1			1			
dine							1				1		1				
falls		1								1				1			
feet		1								1							1
fell					1					1				1			
fit					1					1							1
form		1								1				1			
fresh					1					1					1		
gum					1						1		1				
hence					1					1			1				
hood		1								1						1	
if				1											1		
last					1				1						1		
ma			1					1									
mist					1			1							1		
myth					1			1							1		
ox	1																1
paid		1										1				1	
pare		1										1		1			
past					1							1			1		
pearl		1										1		1			
peg					1							1				1	
plow			1									1					
press					1							1			1		
rage		1							1						1		
reach		1							1						1		
ridge					1				1						1		
roam		1							1				1				
scratch					1					1					1		
sell					1					1				1			
ship					1					1							1
shock		1								1							1
stride							1			1						1	
tube		1										1				1	
vice							1			1					1		
weep		1							1								1
weird							1		1					1			
wine							1		1				1				
you		1							1								
count	2	19	2	2	20	0	5	3	9	14	9	11	5	10	16	7	9
all	1													1			
apt				1													1
bet					1						1						1
big					1						1					1	
brace																	
buck		1									1					1	
case					1						1						1
crush		1										1			1		
dart					1							1			1		
falls							1				1		1				
feet		1								1				1			
fell		1								1							1
fit					1					1				1			
form					1					1							1
fresh					1					1					1		
gum					1					1					1		
if					1						1		1				
last				1											1		
mist					1			1							1		
ox	1																1
paid		1										1				1	
past					1							1			1		
pearl		1										1		1			
sell					1					1				1			
ship					1					1							1
tube		1										1				1	
weep		1							1								1
weird							1		1					1			
wine							1		1				1				
you		1							1								
	2	9	0	2	13	0	3	1	4	8	6	6	3	6	7	4	8
Actual	6.7%	30.0%	0.0%	6.7%	43.3%	0.0%	10.0%	3.8%	15.4%	30.8%	23.1%	23.1%	10.0%	20.0%	23.3%	13.3%	26.7%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	1	1	-1	-1	1	1	2	1	-1	-1	0	0	0	1	2	-1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
aims	1												1				
art	1													1			
axe				1													1
bale		1									1			1			
bless					1						1				1		
camp					1							1	1				
cat					1							1					1
chaff					1					1					1		
chain		1								1			1				
chill					1					1				1			
chip					1					1							1
claw			1									1					
claws		1										1			1		
crab					1							1				1	
cub					1							1				1	
debt					1						1						1
dice							1				1				1		
dot		1									1						1
fade		1								1						1	
fat					1					1							1
flair		1								1				1			
fool		1								1				1			
freeze		1								1					1		
got		1									1						1
grab					1						1					1	
gray			1								1						
grew					1						1			1			
gush					1						1				1		
hide							1			1						1	
his					1					1					1		
hush					1					1					1		
lime							1		1				1				
lip					1				1								1
loud							1		1							1	
lunge					1				1				1				
lynch					1				1				1				
note		1						1									1
ouch	1														1		
rob		1							1							1	
rose		1							1						1		
sack					1					1							1
sash					1					1					1		
share		1								1				1			
sieve					1					1					1		
thaw			1							1							
thine							1			1			1				
thorn		1								1				1			
trod		1										1				1	
waste		1							1						1		
weed		1							1							1	
count	3	17	3	1	21	0	5	1	9	19	10	7	7	8	13	9	10
aims	1												1				
art	1													1			
axe				1													1
bless					1						1				1		
camp					1							1	1				
cat					1							1					1
chill					1					1				1			
chip					1					1							1
claw			1									1					
claws		1										1			1		
crab					1							1				1	
cub					1							1				1	
dice							1				1				1		
dot		1									1						1
fade		1								1						1	
fat					1					1							1
fool		1								1				1			
freeze		1								1					1		
got		1									1						1
gray			1								1						
grew					1						1			1			
hide							1			1						1	
his					1					1					1		
hush					1					1					1		
lime							1		1				1				
lip					1				1								1
loud							1		1							1	
note		1						1									1
rob		1							1							1	
rose		1							1						1		
	2	9	2	1	12	0	4	1	5	9	6	6	3	4	7	6	8
Actual	6.7%	30.0%	6.7%	3.3%	40.0%	0.0%	13.3%	3.7%	18.5%	33.3%	22.2%	22.2%	10.7%	14.3%	25.0%	21.4%	28.6%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	1	-1	0	0	1	0	2	0	-2	-1	1	0	2	0	-1	-1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
age	1														1		
bark		1									1			1			
bay			1								1						
bough			1								1						
buzz					1						1				1		
cab					1							1				1	
cage		1										1			1		
calve					1							1			1		
can't					1							1	1				
chat					1					1							1
chose		1								1					1		
crude		1										1				1	
cup					1							1					1
dough			1								1						
drug					1						1					1	
dune		1									1		1				
ebb				1												1	
fan					1					1			1				
find							1			1			1				
flank		1								1			1				
fond		1								1			1				
gin					1					1			1				
god		1									1					1	
gyp					1					1							1
hike							1		1								1
hut					1					1							1
lad					1				1							1	
led					1				1							1	
lose		1							1								
lust					1				1						1		
notch					1			1							1		
on	1												1	1			
paste		1										1			1		
perch		1										1		1			
raft					1				1						1		
rote		1							1								1
rule		1							1					1			
sat					1					1							1
shy			1							1							
sill					1					1				1			
slid					1					1						1	
splash					1					1					1		
steed		1								1						1	
thief		1								1					1		
throat		1								1							1
up				1													1
wheel		1							1					1			
white							1		1								1
yes					1				1						1		
yield		1							1					1			
count	2	18	4	2	21	0	3	1	12	17	8	8	8	7	12	9	10
age	1														1		
bark		1									1			1			
buzz					1						1				1		
cab					1							1				1	
cage		1										1			1		
can't					1							1	1				
chat					1					1							1
cup					1							1					1
dough			1								1						
drug					1						1					1	
ebb				1												1	
wheel		1							1					1			
find							1			1			1				
god		1									1					1	
hike							1		1								1
hut					1					1							1
led																	
notch					1			1							1		
on	1												1	1			
paste		1										1			1		
perch		1										1		1			
raft					1				1						1		
rule		1							1					1			
sat					1					1							1
shy			1							1							
slid					1					1						1	
white							1		1								1
thief		1								1					1		
throat		1								1							1
up				1													1
	2	9	2	2	11	0	3	1	5	8	5	6	3	5	7	5	8
Actual	6.7%	30.0%	6.7%	6.7%	36.7%	0.0%	10.0%	3.8%	19.2%	30.8%	19.2%	23.1%	10.7%	17.9%	25.0%	17.9%	28.6%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	-1	1	-1	-1	1	1	1	2	0	-1	0	0	0	1	0	1	-1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
word	Initial Long	Medial Lor	Final Long	Initial shor	Medial sh	Final short	Medial Dip	Initial Tran	Initial Semi	Initial Frica	Initial Voiv	Initial Unvo	Final Tran	Final Semi	Final Frica	Final Voic	Final Unvo
ace	1														1		
base		1									1				1		
beard		1									1			1			
brass					1						1				1		
cart		1										1		1			
click					1							1					1
clog		1										1				1	
cork		1										1		1			
crate		1										1					1
did					1						1					1	
duke		1									1						1
eye							1										
fair		1								1				1			
fast					1					1					1		
flash					1					1					1		
gang		1									1		1				
get					1						1						1
gob		1									1					1	
hump					1					1			1				
in				1									1				
joke		1								1							1
judge					1					1					1		
lid					1				1							1	
mow			1					1									
pack					1							1					1
pad					1							1				1	
pew			1									1					
puss					1							1			1		
quip							1					1					1
ramp					1				1				1				
retch					1				1						1		
robe		1							1							1	
roost		1							1						1		
rouge		1							1						1		
rout		1							1								1
salve					1					1					1		
seed		1								1						1	
sigh			1							1							
skid					1					1						1	
slice							1			1					1		
slush					1					1					1		
soak		1								1							1
souse							1			1					1		
theme		1								1			1				
through		1								1				1			
tilt					1							1		1			
walk					1				1								1
wash		1							1						1		
web					1				1							1	
wise							1		1						1		
count	1	20	3	1	20	0	5	1	11	16	8	11	5	6	16	9	10
ace	1														1		
base		1									1				1		
beard		1									1			1			
brass					1						1				1		
cart		1										1		1			
click					1							1					1
cork		1										1		1			
crate		1										1					1
did					1						1					1	
duke		1									1						1
eye							1										
fair		1								1				1			
fast					1					1					1		
flash					1					1					1		
get					1						1						1
in				1									1				
joke		1								1							1
lid					1				1							1	
pack					1							1					1
pad					1							1				1	
ramp					1				1				1				
robe		1							1							1	
seed		1								1						1	
slice							1			1					1		
tilt					1							1		1			
walk					1				1								1
wash		1							1						1		
web					1				1							1	
wise							1		1						1		
sigh			1							1							
	1	11	1	1	13	0	3	0	7	7	6	7	2	5	8	6	7
Actual	3.3%	36.7%	3.3%	3.3%	43.3%	0.0%	10.0%	0.0%	25.0%	25.0%	21.4%	25.0%	6.9%	17.2%	27.6%	20.7%	24.1%
Target	4.0%	32.0%	4.0%	4.0%	40.0%	4.0%	12.0%	10.8%	19.6%	26.1%	19.6%	23.9%	10.8%	19.6%	26.1%	19.6%	23.9%
change needed	0	-1	0	0	-1	1	1	3	-2	0	-1	0	1	1	0	0	0